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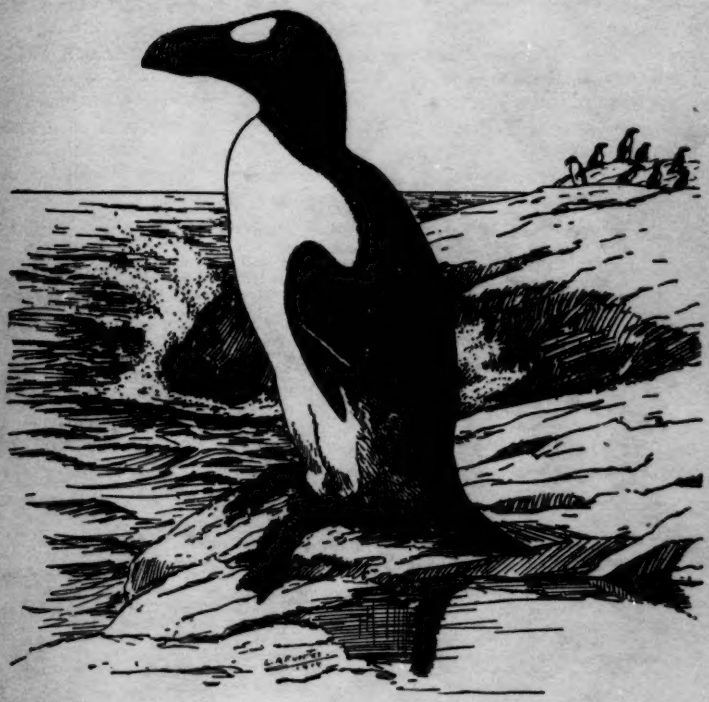

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NEST OF TODY FLYCATCHER (TODIROSTRUM CINEREUM FINITIMUM).

1. AN EARLY STAGE IN CONSTRUCTION.
2. SAME NEST TWO DAYS LATER, SHOWING EXCAVATION OF THE PENDENT MASS TO FORM THE NESTING CHAMBER.
3. COMPLETED NEST.

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THE HABITS AND NESTING ACTIVITIES OF THE NORTHERN TODY FLYCATCHER IN PANAMA.

BY ALEXANDER F. SKUTCH, PH.D.

Plate XI.

I SPENT the period from November, 1928 to June, 1929 on one of the plantations of the United Fruit Company near Almirante, in the province of Bocas del Toro, Panama. Although botanical investigations occupied the major portion of my time, I devoted most of my spare hours to the companionship of the birds which were so numerous about the precincts of the Research House and Laboratory. Flycatchers of several kinds were among the most abundant and characteristic birds in the vicinity of dwellings, and none more numerous than the Northern Tody Flycatcher (*Todirostrum cinereum finitimum* Bangs). The appearance of the completed nest of this wide spread species has been described by Cherrie,[1] and more briefly by Carriker,[2] Richmond,[3] and Stone,[4] but so far as I am aware the indirect manner of its construction has never received the attention it merits.

[1] Cherrie, George K. Notes on the Nesting Habits of Several Birds at San Jose, Costa Rica. Auk VII: 233–237, 1890.

[2] Carriker, M. A., Jr. Annotated List of the Birds of Costa Rica, including Cocos Island. Ann. Carnegie Museum, VI: 314–915, 1910.

[3] Richmond, Charles W. Notes on a Collection of Birds from Eastern Nicaragua and the Rio Frio, Costa Rica. Proc. U. S. Nat. Museum, XVI: 479–534, 1893.

[4] Stone, Witmer. Birds of the Panama Canal Zone with Special Reference to a Collection made by Lindsey L. Jewel. Proc. Acad. Nat. Sciences, Philadelphia, LXX: 239–280, 1918.

2. SAME NEST TWO DAYS LATER, SHOWING EXCAVATION OF THE PENDENT MASS TO FORM THE NESTING CHAMBER.
3. COMPLETED NEST.

The little Northern Tody Flycatcher is a bird of most bizarre appearance. With the exception of our Ruby-throated Hummingbird, it is smaller than any of our native birds of the Eastern States; the length is given by Mrs. Sturgis[1] as 3.60 inches. The upper parts are generally dark; the black of the forehead and crown extends to below the eye, the back and rump are olive green; the wings and tail are mostly black, but the yellow tips of the wing coverts form a distinct wing bar. The under parts, including the lower part of the cheeks, the chin and throat, are sulphur yellow. The head seems over-large for the small body and the bright yellow iris is accentuated by the jet black feathers among which it is set. The short, narrow tail is continually wagged from side to side as the bird hops about in the trees and bushes surrounding habitations and along the banks of rivers and lagoons. Its notes are several and varied. The birds of a pair often call and answer each other with a low, measured *tick tick tick*, and they also utter a high-pitched little trill which is very pleasant to hear. When angry they pursue an enemy while making a sharp, clicking sound by rapidly closing their broad bills. In catching their insect food they do not, like their larger relatives, perch in some exposed situation and make long swoops after the passing fly or moth, but rather snatch it up on the wing as they make short darts from limb to limb of the sheltering tree. Sometimes, too, they fly against a leaf on which an insect is resting and pluck it off, and often they climb about the boughs, picking insects from the leaves and bark more in the manner of a Warbler or a Vireo than a Flycatcher. They have a queer habit of hopping sideways along the branches for considerable distances, wagging their narrow tails from side to side as they go.

The broad, flat bill which so admirably adapts the Flycatcher to carry on the activity for which he is named hardly fits him to be a weaver, yet in the tropics several species build pendent nests which, in the comfort and security they afford their occupants, might well make an Oriole jealous. The method of their construction is perforce quite different. The sharp-billed Oriole would probably look upon the Tody Flycatcher, with his roundabout method of

[1] Sturgis, Bertha Bement. Field Book of Birds of the Panama Canal Zone. New York, 1928.

construction, as an indifferent worker, but if we are to judge by the finished product alone, he seems to be quite as competent as the skillful weaver to fashion a safe and comfortable retreat.

It was in the last week of February that I stumbled across a loose, irregular mass of brownish material hanging about five feet above the ground from one of the branches of the croton bush (*Codiaeum variegatum*) on the front lawn (Plate XI, fig. 1). In the tangled aggregation of material there was a liberal proportion of fibres pulled from the decaying leaf-sheaths of the banana plants which grew all about us, plant down, pieces of weeds, and dry and shrivelled bits of leaves, all inextricably entangled and bound together into a coherent whole by the liberal use of cobweb. There was no sign of a cavity, and I was at first quite puzzled as to the origin and significance of this strange conglomeration, not recognizing it as the beginning of a bird's nest until, a day or so later, I saw a Tody Flycatcher with a length of fibre in its bill perch on the limb where it was attached and then, crawling head downward over the side of the structure, entangle the fibre in the general mass.

The male was indistinguishable from his mate, but since I sometimes saw the two birds working on their nest at the same time, I know that he helped her with the work. The birds were very desultory at their task, bringing in a few bills-full of material, then wandering off to feed or rest for a considerable period, and if at any time I resolved to stand by and watch them build, I was more than likely to have spent an hour in vain. Still the mass continued to augment, until one day I saw one of the birds, whether the male or the female I could not tell, clinging to the side and spreading apart the fibres, until a small depression was formed. (Plate XI, fig. 2). The birds now continued to work into the mass from one side and spread apart the material until in the central portion, where it was thickest, it enclosed an irregular chamber, which was reached through a small aperture in the side. This simple operation in itself consumed several days. As the nest then stood it would have been a very unsatisfactory chamber in which to deposit eggs, for there was no proper floor, and the surrounding walls were loose and thin.

Now began the lining of the chamber, the most time-consuming portion of the building operation. First they carried in fine grass

and plant down, continuing this in their desultory manner for about four weeks, and lining the cavity all around. It was at this period that they pilfered the down which, in the face of great difficulties, a Hummingbird had collected for a nest in a nearby cashew tree. Finally the chamber was padded with downy feathers moulted by domestic chickens and, after I had impatiently remarked in my notebook that the nest was "practically completed two or three weeks ago," the female laid the first egg (Plate XI, fig. 3.).

Thirty-two days had elapsed from the time I first noticed the beginning of the nest. I should have accused these birds of undue procrastination, had not another pair which built in an avocado tree nearby spread their building operations over a slightly longer term. Compared with the number of days consumed by the average song-bird which builds an open nest, even where the female works alone, this certainly seems a long time. On the other hand there are records of even longer periods: the Bienteveo Tyrant (*Pitangus bolivianus*), as we learn from Hudson's 'Birds of La Plata,' sometimes consumes from five to six weeks in the construction of its bulky, untidy, dome-shaped nest, while the Red Oven-bird (*Furnarius rufus*) often begins its elaborate nest of mud in the autumn, and works on it during favorable weather throughout the winter preceding its occupancy. The Whistling Thorn-bird (*Phacellodomus sibilatrix*) has a similar habit.

The completed nest bore the marks of the indirect manner in which it was constructed. From its attachment to the limb to the dangling extremity it measured about a foot. Only a little over a third of this length was occupied by the nesting chamber itself. Above this was the gradually contracting stalk by which it was attached to the branch, while below hung a long, loose and apparently useless tail, both representing the unexcavated portions of the originally "solid" mass. It is the long, useless appendage hanging below the nesting chamber which at once distinguishes the nest of the Tody Flycatcher from the woven nests of Orioles, Oropendolas, Weaver-birds and Bush-Tits, and hints at the different mode of origin. Those birds which are true weavers do not, like the Tody Flycatcher, find it necessary to employ cobweb to bind their materials together. Richmond has remarked, not without

justice, that the nests of these birds are "ragged in appearance" and "resemble bunches of drift grass." Let us not, however, judge of their utility from their often untidy appearance. The long banana fibres which, where available, form the chief suspension of the nest, and the liberal use of cobweb in binding all of the materials together, make the structure strong and durable. The walls of the cozy nesting chamber are usually so thick that the interior remains dry even after hours of rain. The small aperture in the side is in most cases protected by a short, pent-roof projection from above, further adding to the protection enjoyed by the brooding bird. This, it is true, seems to be formed as a result of the birds always alighting below the aperture and moving upward in entering their nest during the period of construction, rather than in pursuance of any architectural design. Generally hung far out on a slender, projecting twig, one would think them inaccessible to all but winged enemies, but none-the-less, they are often despoiled of eggs or nestlings.

The birds employ a great variety of material in the construction of their nests, and different nests vary greatly in their composition according to what the locality affords. They seem always to be begun by entangling fine fibres about a slender support, and fastening them there with cobweb. Various bits of non-fibrous materials, such as small pieces of papery bark, withered flowers, plant down, fragments of weeds and the like are fastened into the mass with cobweb, long before the cavity is started, and serve to give it bulk. The lining is likewise composed of a great variety of materials. A nest in a saman tree in the pasture, which the birds were engaged in tearing apart when I found it, was lined with a great mass of the withered flowers of this leguminous tree, a few horse hairs, and other miscellaneous material. Carriker found nests in Costa Rica which were "made almost entirely of green moss, with some weed-fibre intermixed, and greatly resembled a bunch of moss hanging from a twig." None of the nests which I found, however, contained moss or other green material.

Although three is the more usual number for the species, the birds in the croton bush laid only two delicate, snow white eggs. I shall not soon forget my sensations when I first came face to face with the brooding bird. Warned by the watchful mate, it always

flew off at my approach in the day time, even if I came up to the nest from the rear, so one night I stealthily advanced with a flashlight. When the beam first fell upon the nest the bird was sleeping, its head, black to below the eyes, yellow on the cheeks and throat, framed in the narrow aperture. Presently with a startled shaking of the head, the eyelids parted and, to my great surprise, revealed an iris yellow on the sides and bottom, but blood-red above the pupil, giving the face a weird and somewhat demoniacal expression.

The pent roof over the aperture made it impossible to see the eggs inside, so it was only by carefully probing the interior with the little finger that I could determine when the eggs were laid, and when they hatched. Two weeks passed, and still I felt only the smooth surfaces of the eggs within the nest. Two, and three more days slipped by, and I began to fear that the eggs had addled, for twelve to fifteen days is the usual period of incubation of the various species of flycatchers which nest in the north. Finally, on the eighteenth day from the laying of the second egg, they both hatched. I might suspect some irregularity or error of observation, had I not followed the incubation in three other nests, and found that the period given is correct. In incubation, as in nest-building, the Tody Flycatcher will not be hurried.

The nestlings were but a few days old when some undetermined fate overtook them. The parents had now spent almost two months in their attempt to raise a family, and perhaps they at last began to realize that if they were ever to accomplish their purpose in life, a little more expedition would be in order. At any rate, three days after their bereavement, they had made a substantial start at a new nest among the blossoms of a hibiscus bush fifty feet away. The old nest was hardly injured; the aperture merely enlarged a trifle by whatever creature devoured the nestlings, and might readily have been repaired, but some prudence which we do not understand prompted them not to entrust a second brood to the scene of the disaster. Yet at bottom they were economical, for they tore away the material which composed the old nest and incorporated it in the new. I saw them make frequent trips between the two structures, pulling fibres from the old nest until its support gave way and the remnant fell to the ground.

For some reason, the new nesting site did not please them; perhaps the "yard boy" brushed against the nest and injured it while cutting the grass or trimming the hibiscus hedge, which it almost touched. For this reason or another, after they had worked upon it for twelve days and had made a good start at lining the nesting chamber, they began to tear it apart and to use its materials in the construction of a third nest in the cashew tree across the hedge. This was the highest of all the nests which I saw the pair attempt, and hung from an unsubstantial dead twig seven feet above the ground. The construction of this latest nest required only half the time of the first, and after sixteen days the first egg was laid. When I left Panama early in June they still brooded the two eggs, and I could only wish that, after three months of continuous effort, fortune would at last smile upon their endeavors.

All of the breeding records of this species which I have been able to find refer to the spring or early summer. In Nicaragua, Richmond found a nest with eggs on March 31. In Costa Rica, Carriker found nests with fresh eggs from April 11 to July 17, while Cherrie took a nest with eggs near San Jose on May 30. In the Panama Canal Zone, Stone gives the dates April 21, April 30, and June 23. My own records of fresh eggs fall between March 28, and the first weeks of June, when I left Almirante. Since the birds may consume a month or more in the construction of the nest, this period should be added to the earliest dates, given to obtain the actual commencement of the impulse to breed. The late records are probably of birds which have had their previous nests rifled; at least this is true of my own records. It is of considerable interest that in a uniform climate such as that of the Caribbean coast of Panama, where there is not even a pronounced dry season, so many species of birds should begin their nesting in the spring—just as the migrants are beginning to depart. The same impulse must determine both. The one unmistakable sign of spring which I discovered in Panama was the wooing and nesting of the birds.

In April and May the pendent nests of the species were to be found almost everywhere in the open. I remember several which hung from the telephone wires along the railroad, the birds apparently unmindful of the frequent passage of the thundering

banana trains. A number more were found attached to low branches which overhung the lagoon. One nest was precariously suspended from the petiole of a leaf of the rubber tree (*Hevea brasiliensis*) which grew beside our water tanks. Not counting replacements of rifled nests, nine were found in trees and bushes within about a hundred yards of the house, and I soon ceased to keep count of those which I encountered farther afield. Despite the apparent security of the eggs and young swinging in a closed basket at the end of a slender twig, the nests were robbed with surprising frequency. Although I selected five of the most favorably situated nests for close observation, in every case I was disappointed in my desire to follow a single family through the entire nesting period; either before or after the eggs hatched every one of these nests were robbed. It was never my good fortune to come upon the despoiler, but I hardly believe it could be other than a bird, and the Talamanca Jay (*Cyanocorax affinis zeledoni* Ridgway) falls under suspicion. Sometimes small flocks of these noisy Jays ventured into the trees or the banana groves close to the house, when the excited behavior of the nesting Thrushes and Tyrant-birds proclaimed them to be, like their relative the Blue Jay, nest robbers; yet I confess to a complete lack of evidence to incriminate them in any misdemeanor whatever.

When a nest was robbed the birds invariably tore it apart, even if it were not in the least injured, and used the materials in the construction of a second, nearby. The Cedar Waxwings observed by Gross[1] behaved in the same way when their nest was despoiled of its eggs, and doubtless similar cases will occur to anyone who has spent much time observing birds. It would be interesting to understand the mental processes underlying this behavior. Does the bird realize that an enemy has discovered the nesting site, and so is unwilling to entrust a second clutch of eggs to the same nest? Or is it merely instinctive with these birds not to lay a second time in a used nest, which may have become soiled or infested with parasites during the occupancy of the first brood, and in accordance with this instinct a new nest is built whether the first has sheltered nestlings or not? A grave objection to the second alternative is

[1] Gross, William A. A Cedar Waxwing Study in Northern Michigan. Bird-Lore, XXXI: 178–182, 1929.

that the materials of the old nest are incorporated into the new, and any parasites they might harbor would in this manner be carried over into the new structure. Consciousness that an enemy is aware of the location of the nest might also explain the behavior of certain birds in deserting a nest in which a Cowbird has deposited an egg, instead of taking the less troublesome alternative of casting out the undesirable egg, or at least covering it with a false bottom. At any event, in all cases where I was able to find the Tody Flycatcher's second nest, it was in the same "territory" as the one it was intended to replace; perhaps higher up in the same tree, or on the other side of it, or in a nearby tree; often better concealed than the first, sometimes not so well concealed. These birds seem particularly attached to their territory, and defend it valiantly against the intrusion of their own kind.

In early May I spent much time watching a nest which contained three newly-hatched nestlings. One of the parents, presumably the mother, brooded her infants during most of the day and of course at night. The father hopped about the boughs of the tree, searching for insects. Frequently he called to his mate in his high-pitched trill, and she answered with a similar trill from within the nest. Having made a capture he would approach the nest flitting from limb to limb in his usual unhurried manner, often stopping to wipe the insect he held against the bark, perhaps in an attempt to break off the wings. Meanwhile the expectant mother would lean far out of the nest, as though impatient of his delay. Finally he would fly up and, clinging beneath the aperture as a Woodpecker to the bark of a tree, pass in the billful to his brooding mate. After he flew off, by peering through the field glasses into the dimly-lighted interior, I could barely discern her bend down her head and place the insect in the mouth of one of the nestlings which she covered. At intervals she left the nest for short periods to seek food for herself, but on returning, before entering the chamber to continue her brooding, she paused a moment before the entrance and passed the moth she brought back to one of the waiting mouths within. Two and then one, the nestlings met the mysterious fate of so many others, but the mother continued to brood the last survivor during the sixth and final day of his life. With such unusually close attention, the parents brooding the

young by day at an age when Song Sparrows are almost ready to leave the nest, one wonders why the nestling mortality is so high.

Because of the persistent misfortunes to which I have alluded, I was unable to determine how long the young remain within the nest, and the details of parental care at various ages. A few days before my departure from Panama, I came across a nest which, though quite close to the house, had for a long while escaped my notice, and now contained two nearly fledged young. Their irides were brown, not yellow and red as in the adult birds. When alarmed by my intrusion, even at night, they uttered a little trilling chirp which resembled that of their parents, but was weaker. The adult birds clung beneath the aperture and passed in food to them. The interior of the nest was clean, but the nestlings appeared so crowded that it seemed that had a third been present, they must burst the chamber asunder. When they finally left the nest a few days later, and flew into the branches of a tamarind tree nearby, the parents protected them with energy. When a pair of Black-winged Palm Tanagers (*Thraupis palmarum atripennis* Todd) and some Scarlet-backed Passerini's Tanagers (*Ramphocoelus passerinii* Bonaparte), birds over twice the size of the Flycatchers, attempted to perch on its limbs, the parents darted at them, making a loud clacking sound with their broad bills, and drove the harmless intruders away. The outstanding characteristic of this little Flycatcher is his devotion to his mate, his home and his family.

3509 Clark's Lane,
Baltimore, Maryland.

ON THE FOOD OF CERTAIN OWLS IN EAST-CENTRAL ILLINOIS.

BY ALVIN R. CAHN, PH.D. AND JACK T. KEMP.

DURING the last three years, opportunities have arisen which led the writers to make an intensive investigation of the food of the Owls in the immediate vicinity of the State University at Urbana, Illinois, in order to determine what vertebrates contribute to the diet of the various species. The finding of a roosting place inhabited by Long-eared Owls through two successive winters afforded pellets in great numbers, and equally favorable opportunities have arisen for a study of the food of other species as well. The data herein offered, excepting only those relating to the rare Snowy Owl, have been gathered entirely from an investigation of regurgitated pellets, of which 1587 have been critically examined. The pellets were soaked for some hours in water, then placed in running water and the enveloping hair washed off, leaving a clean mass of bones in the bottom of the dish. The results of identification of the bones will be summarized under each species of Owl concerned. It is needless to say that pellets of unknown origin have not been considered. To the writer's collection of pellet remains have been added several bottles of bones in the possession of the zoology department of the University, which represent previous collections made from Owl pellets, and bearing the identifications of Dr. L. R. Dice. In order to determine the number of individuals of the smaller mammals involved in the various pellets, a lower mandible was arbitrarily fixed upon as the key, first, because each animal carries but two; and secondly because the mandible is a firm bone that is not often broken and hence is usually recognizable.

Tyto alba pratincola. BARN OWL.—The Barn Owl is now a very rare species in east central Illinois. It was, therefore, with much interest that I received fifty-four pellets which were sent to the University by a farmer living near Philo, Illinois. The pellets had been gathered in a barn in which a pair of these birds spent some three weeks before they were thoughtlessly killed. The pellets showed the following contents.

Mammals.

Microtus austerus	14	28%
Mus musculus	21	42%
Mus norvegicus	6	12%
Blarina brevicauda	2	4%
Peromyscus maniculatus bairdii	3	6%

Birds.

Passer domesticus	4	8%

Asio flammeus. SHORT-EARED OWL.—During the fall of 1926, two birds of this species frequented the fields just south of the University. Careful examination of the ground in these fields yielded 137 pellets regurgitated by these birds, and these pellets contained the following skeletal remains.

Mammals.

Microtus austerus	33	29.2%
Peromyscus maniculatus bairdii	46	40.7%
Blarina brevicauda	4	3.5%
Mus musculus	26	23.0%
Scalopus aquaticus machrinus	1	.9%

Birds.

Sturnella magna magna	2	1.8%
Pooecetes gramineus gramineus	1	.9%

Asio wilsonianus. LONG-EARED OWL.—During the winters of 1926 and 1927, a little "colony" of seven Long-eared Owls wintered in an evergreen in the heart of the residence district of the city of Urbana, within a few blocks of the University. The number of birds that returned each day to roost in this same tree varied, of course, but never a day passed but four or five birds were to be seen sleeping in the deep shadows. The largest number seen at one time was seven, and as this number was observed on no less than forty-four occasions, it is believed that represents the total number of birds in the group. The average number seen on all occasions was five. Weekly trips were made to the tree, and all pellets found were brought in from November 8, 1926 when the birds were first located, to the following April 2, when they left for the summer. In 1927 the birds returned to the same tree on October 21 and remained until the following March 16. In all, 1201 pellets were found and examined. This, on a basis of five birds to the "roost" is a trifle less than one pellet per bird per day. While care was taken to get every pellet possible, no doubt some escaped collection, and certainly not all the food eaten was regurgitated in this one spot. In the case of many pellets which contained skulls which had not been disarticulated, it is interesting to note that in almost every case the otic and occipital regions had been crushed, and the parietal

bones were seldom intact. This indicates that the Owl kills by crushing the skull at its widest point, and death must be rapid. The following vertebrates have been identified in the pellets of this species of Owl.

Mammals.

Peromyscus maniculatus bairdii	52	4.24%
Peromyscus leucopus noveboracensis	621	52.3 %
Microtus austerus	318	26.5 %
Blarina brevicauda	34	2.84%
Mus musculus	122	10.2 %
Mus norvegicus	19	1.5 %
Condylura cristata	2	.16%
Lasiurus cinereus	2	.16%
Nycticeius humeralis	3	.25%
Geomys bursarius	1	.08%
Tamias striatus lysteri	2	.16%
Sciuropterus volans	2	.16%

Birds.

Cardinalis cardinalis cardinalis	1	.08%
Sturnella magna	1	.08%
Junco hiemalis	5	.42%
Passer domesticus	8	.66%
Zonotrichia albicollis	2	.16%

Amphibia.

Ambystoma microstomum	1	.08%
Rana pipiens (?)	1	.08%

Reptiles.

Storeria dekayi	1	.08%

In the department of Zoology are several vials containing in all 393 lower right mandibles of *Peromyscus leucopus noveboracensis*, bearing the label: "Long-eared Owl pellets; Urbana, Illinois," but with no further data. These are not included in the above tabulation.

Strix varia varia. BARRED OWL.—With the disappearance of areas of "big timber," the larger owls have tended to desert the region under discussion, though the Barred Owl is still occasionally met with near Urbana. During the winter of 1925 two birds of this species inhabited Brownsfield woods for several months, and fifty-four pellets belonging to this species were collected from the area at that time. Fourteen more were gathered at Turkey Run, Indiana, in 1928, and since this region is just across the state line and but little south and east of the area under discussion, these pellets have been included in the following summary.

Mammals.		
Sylvilagus floridanus mearnsi	5	15.%
Microtus austerus	11	31 %
Peromyscus leucopus noveboracensis	8	24 %
Sciurus carolinensis leucotis	2	6 %
Didelphis virginiana	1	3.%
Birds.		
Woodpecker sp.	1	3 %
Planesticus migratorius migratorius	2	6 %
Zenaidura macroura carolinensis	1	3 %
Corvus brachyrhynchos brachrhynchos	1	3 %
Poultry (remains in 5 pellets)	1 (?)	3 %
Amphibia.		
Rana pipiens	1	3 %

In the case of the above species, the percent based on the number of individuals involved is of less significance than in the case of the preceding species, as the relative size of the mammals involved varies so greatly. In this tabulation it should be noted that probably more than five rabbits are represented. Rabbit bones were found in forty one pellets but only five lower incisors (left) were found, so that that number at least must have been present. Other bones were so badly broken that it was impossible to use them in determining the number of rabbits involved. A single rabbit yields many pellets. Chicken bones were present in five pellets, but there was no way of determining how many birds were included. Still, as all the pellets containing poultry were found together, it is doubtful from the data at hand if more than one bird was killed.

Otus asio naevius. SCREECH OWL.—Screech owls are common throughout the state. Near the University they may be found at all seasons of the year if one searches for them. During the late fall and winter of 1928, 143 pellets cast by this species were collected from the forestry preserve and the cemetery south of the campus, and these give an excellent clew to the winter food of the species.

Mammals.		
Mus musculus	88	68.8%
Peromyscus leucopus noveboracensis	23	18. %
Blarina brevicauda	5	3.9%
Peromyscus maniculatus bairdii	2	1.5%
Birds.		
Passer domesticus	5	3.9%
Certhia familiaris familiaris	2	1.5%
Sitta carolinensis carolinensis	1	.8%
Penthestes atricapillus atricapillus	1	.8%
Sturnus vulgaris	1	.8%

Nyctea nyctea. SNOWY OWL.—The unusual southern migration of the Snowy owl which occurred in the winter of 1926-27, brought to our attention seven records in central Illinois of this ordinarily very rare bird. Of these seven birds, three passed through our hands while still in the flesh, and the stomachs of these were examined for their food contents. While in no sense fat, these birds were in excellent condition, though their stomachs were disappointingly empty. One stomach was entirely empty; the other two showed the following items:

Mammals.

Peromyscus leucopus noveboracensis	3
Blarina brevicauda	1

Birds.

Junco hyemalis	1

Perhaps the fact that all three of these Owls were shot late in the afternoon accounts for the few items discovered.

DISCUSSION.

Because of the nocturnal feeding habits of Owls, little information is at hand as to the feeding grounds of the various species—whether they feed and hunt in the woods or in fields or swamps. An examination of the vertebrate remains found in the regurgitated pellets gives a very good index to this subject. *Peromyscus maniculatus bairdii*, the white-footed prairie mouse, is distinctly an inhabitant of the open fields, and in Illinois is practically never to be found in woodlands or associated with stumps and other cover. On the other hand, *Peromyscus leucopus noveboracensis*, the white-footed wood mouse, has a distribution that is co-extensive with the woodlands and is rarely taken in the open fields. With these facts in mind, it is interesting to note that the Short-eared Owls found 46 prairie mice and not a single one of the woods species. The Long-eared Owl found 52 of the prairie mice as against 621 of the wood mice. There can be but little question where these two species of Owls are doing their hunting. The Barn Owl found 3 prairie mice, but no wood mice, and the Barred Owls 8 of the wood mice, and none of the prairie forms. *Microtus austerus*, the so-called prairie vole, requires cover of some sort, be it trees and brush or merely clover or alfalfa, and in central Illinois is more frequently an inhabitant of the high ground rather than of the

low. It is found, however, in about equal numbers in the woods and in the fields. It is interesting to note that the Short-eared Owls found 33 of these animals, while the Long-eared Owls found 318. But when these are reduced to a percentage basis, we find the vole comprising 29.2% of the food of the Short-eared Owl, and 26.5% of the food of the long-eared species, which is about what one might expect from the distribution of the birds. The very common house mouse, *Mus musculus*, which also plays an important part in the menu of the Owls is, like *Microtus austerus*, of general distribution through the woods and fields, which accounts for its appearance in the diet of four of the six species of Owls discussed. During the winter, however, it is more common in the woods, and the Screech Owl has picked up 68.8% of its food from this species of mouse, associating it with the white-footed wood mouse which makes up 18% of the food budget. The appearance of five bats of two species in the food of the Long-eared Owl is interesting, and offers food for speculation, since both Owl and bat are active at the same time. It seems doubtful that the bats could have been caught on the wing.

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A CRITIQUE OF OÖLOGICAL DATA.[1]

BY TRACY I. STORER.

I WISH to direct attention briefly to the subject of oölogical data, by presenting the views of a non-collector, one who has been looking at egg collections as a possible source of data which may be used in the study of biological processes of somewhat wider scope than those contemplated by the average gatherer of bird eggs. Following some studies on amphibians, in which I found interesting control of the seasonal breeding programs of various species by different environmental conditions, I began a search for material among other groups of vertebrates that might be studied with the same end in view. Knowledge of the breeding activities of fishes and reptiles, particularly in the west, where my previous work was done, is so fragmentary that little of profit could be gathered there. The data pertaining to mammals is, while limited, extremely interesting; and I shall present that elsewhere at a later date. When I turned to birds, I began the examination of egg collections and the remarks that follow have arisen as a by-product of this last field of interest. I have great appreciation for the reliable basic material already accumulated regarding bird eggs. My effort here is to indicate some of the shortcomings of the present day work in oölogy, and to point out several directions in which the means of study in this field might be improved.

After listening to many discussions about egg collecting and reading many criticisms and defenses of the subject, I think it may safely be concluded that egg collecting is prompted by three main motives:

1. Mere exercise of the acquisitive instinct.
2. A desire for outdoor pleasure.
3. A sincere interest in increasing the bounds of knowledge relating to bird eggs.

In the minds of most collectors these three motives are inextricably mingled. With a few the second or, worse still, the first

[1] Contribution from the Division of Zoology, College of Agriculture, University of California. Read at the forty-fifth stated meeting of the American Ornithological Union, at Washington, D. C., November 17, 1927.

is the principal motive. A few collectors are strictly of the third type.

Again, collectors may be classified as to those interested in the whole egg, as compared with those whose attention is focused solely upon the shell. There is an important distinction here, for the egg, the ovum, that contained *within* the shell, is after all the part which should really engage the major part of our attention. The shell has been carefully measured, weighed, and described in detail, whereas an almost negligible amount of consideration has so far been given to the contents. Thus, with only one or two exceptions, the shell of every species on the A. O. U. list is known. There are several books treating of the egg shells of North American birds, and several classifications of shells have been based upon size, shape, surface, texture, pigmentation, pattern, number in a clutch, and place of deposition. The adaptive nature of many of these features has been indicated and discussed. Only in a few instances have data from egg shells (in combination with other data) been used to indicate major errors in our previous scheme of classification. Until new means for studying egg shells are devised, further contributions in this direction will, at best, be of a minor nature. The shells of bird eggs are about as subservient to the needs of the individual species as are beaks or claws, and in some groups we find adaptive modifications in the egg shell to meet particular conditions under which those species reproduce. Before attempting to indicate some of the lines of inquiry which may profitably be followed with regard to the true ovum some attention must be given to the shortcomings in our existing collections of egg shells.

These collections are of all degrees of value. Some of the smaller ones based upon the personal take of collectors who make sure of the identity of each bird, and composed of adequately labeled specimens are as trustworthy as any material of science. Other collections, especially the larger ones, assembled from many sources, where dealers, commercial collectors, and "exchange value" have figured, are practically useless from the standpoint of science. Eggs purchased from dealers, eggs obtained in trades where exchange value was the important consideration, and eggs obtained from untrained or unscrupulous collectors are, in general,

of little or no value; often they are misleading and dangerous. An egg with any error in its necessary chain of data may be compared to a palaeontological specimen or an artifact with imperfect labeling as to locality or horizon, save that the latter two classes of articles may sometimes be safely allocated in these respects by subsequent comparisons, while an egg shell seldom or never bears any mark by which its locality of deposition may be determined. The phrase "identification positive" gives no clue to the subsequent user of a set as to the actual basis for identification.

A first important criticism of egg collections pertains to identification. How many collectors of bird eggs are able to identify in the field all of the several species whose eggs they gather? Certain it is that many collectors of skins are unable to identify some of their skins in the field. Are egg collectors sufficiently familiar with the less strikingly marked coloration of the females of many species of birds to ensure correct determination? Is the collector prepared, if necessary, to collect the bird to insure the identity of the eggs? Does the collector depend on the form and location of the nest to identify the eggs or does he wait to see one of the parents flushed from the nest? Is the bird which "scolds" about a nest certainly the "owner" of that nest, or may it not be the owner of another, undiscovered nest nearby? Are the eggs marked *at once* in the field with adequate data to preclude subsequent mixing or erroneous application of data slips?

To show the necessity of raising these questions, I may call attention to specific cases in California. A record for the breeding of the Golden-crowned Sparrow is in doubt because of the circumstances surrounding the taking of the eggs and because of failure to find subsequent nestings in later years. A published record for the early breeding of the Lutescent Warbler with an unusually large clutch of eggs has been questioned as being that of the San Diego Wren, for which the date and size of clutch would not be noteworthy. I have seen one collection where, among the Hawks, the field collector's identifications have been changed (by another hand) on the data blanks, without indication of the reason or authority for the change. I have been told of another collector, imperfectly acquainted with Buteos, who used to label all of his larger eggs *calurus* and the smaller ones *swainsoni*. Another

collector separates the data slips from his eggs, and the cryptic marks on the latter mean nothing to anyone else examining that collection. Another offends still more by gathering eggs in quantity without any sort of identifying marks, believing himself entirely capable of remembering which set belongs with a given data blank.

In happy contrast to all of these is a certain egg collector who, in searching for the eggs of certain species, collects the bird and submits it to a recognized taxonomist before finally labeling the set in question as to the species involved.

Second, the terminology used in describing the stages of incubation in bird eggs is as chaotic as any to be found in the entire field of science. The terms used by any one collector are probably applied with some degree of consistency, but they mean little or nothing to anyone else using his material or even to another collector. In going over any large collection of eggs assembled by exchange or purchase from different sources, one encounters a variety of terms such as "incubation begun," "just turning," "blood," "1/3," "½," or "nearly complete." For accurate study these terms are valueless. The embryology of the chick and of a number of other species of birds has been studied with sufficient detail, so that it would be rather easy to formulate a list of terms, based upon successive appearance of blood, embryonic membranes, feather buds, skeletal elements, natal feathers, and other features which would indicate with some degree of accuracy the stage of incubation encountered in any particular egg. The so-called "small-hole" specialist, who delights in removing the contents of a shell through an aperture of minimum size, is not likely to contribute much in the way of accurate information on the stage of incubation.

A third principal criticism of egg collections as now constituted is that they are comprised to a large extent of fresh first sets and therefore give imperfect information on the extent of the breeding season. Most of the egg collectors plan their program of collecting on the dates for first fresh full sets, and give a much lesser amount of attention to such matters as second sets, second nestings, and average or extreme dates for termination of breeding activities in particular species. Only in a relatively small number of species do we have data showing the entire seasonal program of nesting activities.

What, then, may we hope to obtain from egg collectors through correction of some of the shortcomings mentioned above? First, more accurate identification; this is a subject about which there can be no argument. We need only to impress beginning collectors with the absolute importance of this feature. Any set about which there is the least shadow of doubt should be discarded forthwith.

Second, it is becoming increasingly important that an adequate amount of data be marked on each individual egg. This, at a mimimum, should include an identifying check list number, the date, the set mark, and the collector's initials. The date should be indicated in no equivocal manner; 4–3–27 bears a meaning of April 3 or March 4 and should be written IV–3–27 or Ap–3–27. These data may be applied with pencil, but better still with India ink. Such marking will make it possible for anyone to associate the eggs with the corresponding data blank.

Third, a more rational scheme for indicating the degree of incubation must be developed. It is important to know the degree of incubation so that we may calculate back and ascertain the approximate date upon which the set was complete. Comparison of data sheets shows a surprising weekly periodicity due to the sabbath day activities of egg collectors. This feature in large series may produce an erroneous impression from the raw data.

Fourth, more attention should be paid to second and subsequent sets. Save in the case of rare or vanishing species, absolutely no harm can result should all our egg collectors suddenly begin collecting throughout the nesting season. It is important that we have data on the later seasonal history of many species; and egg collectors are, in many instances, the persons best situated to carry on this sort of observation.

Finally, let me offer some suggestions regarding permits for egg collecting. There has been altogether too much indiscriminate collecting in the past; there is little justification for it to continue. On the other hand, it is important that no beginner in bird study be dissuaded by limitation of his collecting activities. The present high standard of ornithological investigation in this country is due in considerable measure to the extensive early field experiences of many of the workers who for the most part, began by collecting bird eggs. No youngster, at all likely to develop into a serious

student, should be hindered from increasing his knowledge and developing his powers of observation by collecting. He should, if possible, be accorded the help and advice of some reliable experienced worker in the ornithological field. There is no method quite so good as collecting for learning the habits of species intimately and correctly.

But this free-reined opportunity to collect should not be continued indefinitely if the individual fails to improve in his technique and if he fails to obtain and publish material of value to the general field of ornithology. There should be a time limit, during which the "juvenile" manner of collecting should be permitted. For men of mature years who have been collecting for a decade or more to take eggs to no other end than that of selfishly increasing the bulk of a personal collection is of no particular value, and it should not masquerade under the broad cloak of science.

The continued gathering of eggs of our larger birds of prey by collector after collector, simply for the gratification of personal ambitions, is likewise without any particular scientific merit and in some instances may jeopardize the standing of the species. Contrast the barrenness of results from such efforts with the abundant returns to science where one or several bird students combine to study intensively the life history of a scarce species without "collecting" as in the case of the Bald Eagle studies by Professor Herrick and his associates.

Our permits, federal and state, are usually designated as "scientific collecting permits." How much of the material obtained under these permits is genuinely of scientific value?

Oölogy, though always a useful adjunct to the general field of ornithology, must take a fresh viewpoint; when this is done, new and valuable contributions will again be made by its devotees.

Davis, California.

NESTING OF TRUDEAU'S TERN AND DESCRIPTION OF THE YOUNG.

BY D. BERNARD BULL.

Two small nesting colonies of Trudeau's Tern (*Sterna trudeuai*) were visited by me during the latter part of November, 1928, and a record of my observations is here offered.

Both colonies were found near Lavalle (en Ajo) Province of Buenos Aires, Argentina, from information given in Dr. Wetmore's 'Observations on the Birds of Argentina, Paraguay, Uruguay and Chili' (pp. 137).

The first colony was observed at Laguna Milan, November 21. At our approach the Gulls, in whose company the Terns were nesting, and the Terns, arose from their nests and flew about us. The guide poled the canoe from shore through the paja out into the open water, which at that time was about four or five feet deep; however, so dense was the camalote (a variety of vegetation growing from the bottom of the laguna), that it often required our combined efforts to make any progress. There were many more Gulls than Terns, and contrary to the experience of Mr. A. H. Holland (Ibis, 1890, p. 428) the nests of the Terns were well distributed among those of the Gulls. They were scattered. As Trudeau's Tern may be easily distinguished at a distance from the Gulls by the pearly whiteness of its head, its trim shape and smaller size, most of the nests were found by looking for the sitting bird instead of for the nests.

All of the nests were composed of camalote and rested upon a mass of the same, which grew, as before stated, from the bottom of the laguna; some of them were nicely lined with broken sticks and twigs of durasnillo. Similar nesting conditions prevailed at Laguna La Bolsa, where a male bird in breeding plumage was secured on November 24, One of the nests held two young and one egg just hatching. The two young, although not more than a day old, left the nest as soon as they realized themselves discovered and tried to hide among the camalote. They did not swim, for they lacked the strength to make headway against the slight movement

of the water, caused by a light breeze, but they paddled and floated buoyantly, showing plainly that the spirit was willing, however weak was the flesh.

When taken in the hand these little fellows emitted a noise that can be well imitated by holding the tongue against the roof of the mouth and whispering the word *ship*.

The nesting colonies were on fresh water, which was inhabited by a species of fish locally known as "lissa," and it was upon the young of these that the Terns freely fed. The guide stated that a long red worm, found under the "juju crespo" in fresh water, shrimps from Piedras Laguna and other salt water bodies also furnished much of the Terns' food. Although this was not wholly verified it seemed very likely. Some dead caracols on shore attracted numerous flies and insects, and the Terns were feeding on the latter.

The isolation of the nesting grounds of this Tern is such that but few of the eggs have been taken, and there are very few records of collectors finding them. Perhaps the first is of three eggs collected by Mr. A. H. Holland, some time prior to 1890 (Ibis, *loc. cit.*). The late Mr. Ernest Gibson, F. Z. S., who had studied this interesting bird for a number of years, exhibited a few eggs before a meeting of the Zoological Society in London in 1891 (Proc. Zool. Soc. London, 1891, p. 373). And there are seven eggs in the collection of Col. John E. Thayer, taken by Mr. Herbert Ozan on St. Ambrose Island, off the coast of Chile, on December 17, 1907 (Bent's Life Histories of North American Gulls and Terns, p. 227). The nesting there was very different from what we found in Argentina.

No other records are known to the writer and we considered ourselves fortunate, therefore, when we obtained our specimens. There are eleven complete clutches in the series three of three eggs, four of two, and four of one. Two other nests contained one egg each, both fresh, making twenty-three eggs in all. The eggs of four clutches of one each, contained embryos well developed. In comparing this series of eggs with a series of eggs of Forster's Tern (*Sterna forsteri*) there seems but little appreciable difference in either size or coloration.

Mr. Harry S. Swarth, of the California Academy of Sciences, has kindly supplied me with the following description of the downy

young, heretofore unpublished, based upon a specimen given by me to the Academy.

Downy young (one day old). Ground color above rich brown, close to tawny-olive (Ridgway), marked with irregular black streaks and spots. These markings tend to form three stripes on the back, and a central cervical stripe with lateral spots on sides of neck and back of head. Anterior top of head, from eyes to nostril, immaculate. The brownish dorsal coloration extends (somewhat duller and grayer) over the wings, flanks, and lower abdomen. Cheeks (between bill and ears) dusky, a marking that extends, rather sharply defined, across the throat, separating the white chin and whitish breast. Lower breast grayish, merging into the brownish abdomen and flanks. "Eyes soft blue-black, almost indigo, showing great depth. Feet king's yellow (Winsor & Newton); claws black. Base of upper and lower mandible king's yellow (duller than feet), anterior half, black" (collector's field notes).

Seattle, Washington.

A STUDY OF A NESTING OF BLACK-THROATED BLUE WARBLERS.

BY MARGARET MORSE NICE.

ON the afternoon of June 24, 1928, in the Grey Rocks woods in Pelham, Massachusetts, I found a nest of *Dendroica caerulescens caerulescens* containing four young which I estimated to be three days old. It was placed 15 inches from the ground on two dead branches in the center of a nearly dead speckled alder; it was almost entirely constructed of yellow birch, the outer bark on the outside and shreds from the inner bark inside. Although in plain sight, it was inconspicuous because it looked like the top of a birch stub. From above it was protected from the sun and rain by alder leaves.

I watched the nest from a distance of 30 feet, sitting in full view against a hemlock; several times I attempted to move nearer but always had to retire again on account of the timidity of the parents, particularly the female. An hour was spent at the nest the first afternoon, then from three to seven hours each day until July 30, when nine and a half consecutive hours were devoted to observation. A summary of the various activities of each of the ten periods of observation is given in the table.

The Songs. The male Black-throated Blue Warbler sang 1285 times during the 36½ hours; the songs were of four different types which I numbered in the order in which I became acquainted with them.

I. This was a short song, given in a very husky tone; it consisted of three notes on the same pitch followed by a sharply rising one: *hee hee hee weeeeee.* Semi-occasionally there were four preliminary notes. Its length was only 0.6 of a second. Fifteen intervals between beginnings of songs, as measured by a stop watch, varied from 5 to 21 seconds and averaged 10.7. It was sung more often in the afternoon than in the morning, for 73 songs were heard in 14 afternoon hours—or an average of once in 11.5 minutes, and only 50 were uttered in 22½ morning hours, or once in 27 minutes. Usually it was given by itself in series ranging from 3 to 12 songs, but occasionally it appeared in a series of II.

NESTING ACTIVITIES OF A PAIR OF BLACK-THROATED BLUE WARBLERS

Date	Time Eastern Standard	Hours	Number of times fed by Female	Male	Av. rate of feeding in minutes once in	Number of times brooded	Time brooded in minutes	Times faeces eaten by Female	Male	Times faeces removed by Female	Male	Number of Songs I	II	III	IV
June 24	4:20– 5:20 P.M.	1	3	5	7.5	5	37	1	0	0	1	20	22	0	0
June 25	7:40–11:40 A.M.	4	16	23	6.2	8	56	1	1	3	7	5	99	0	0
	2:23– 4:23 P.M.	2	6	11	8.0	3	24	2	3	2	1	27	7	16	0
June 26	7:24–11:24 A.M.	4	13	20	7.3	2	22	0	3	1	9	17	131	12	1
	2:15– 5:15 P.M.	3	10	11	8.6	3	55	0	0	3	4	4	20	3	0
June 27	8:00–11:00 A.M.	3	10	12	8.2	0	0	0	0	4	5	5	123	25	0
June 28	7:23–10:23 A.M.	3	18	18	5.0	1	6	1	0	5	8	2	120	1	0
	2:13– 5:13 P.M.	3	21	18	4.6	0	0	0	1	2	4	2	32	0	0
June 29	7:10–11:10 A.M.	4	26	32	4.1	0	0	0	0	4	12	19	180	1	0
June 30	7:40 A.M.–5:10 P.M.	9½	70	51	4.8	0	0	1	5	23	16	22	352	13	4
Total		36½	193	201	5.6	22	200	6	13	47	67	123	1086	71	5

II. This was the favorite song, for it was heard 1086 times. It was louder, longer (lasting a full second), much less husky than I —a drowsy, sweet little song. There were four preliminary notes and a final one that was usually slightly lower in tone, but occasionally was a little higher and sometimes on the same pitch: *hur hur hur hur weeeeee.* Fifty-four intervals between songs varied from 10.7 to 32 seconds, the average being 17.4.

III. This absurd song sometimes gave the effect of a stutter—*di di di di eeeee,* the *eeeee* being sharply ascending; again it sounded like something mechanical, consisting of three or four *chitters* followed by a sharply ascending *cheeeee.* Sometimes I separated these into two songs, but finally decided to call them variants of one song. At times this was given in short series, and at other times interpolated into series of II. It was recorded 71 times.

IV. This rare song consisted of two notes, the second higher than the first: *dee dree;* its tone was as husky as that of I. It was recorded only five times in the following series: III IV III III; II II II II II II III III III IV; IV IV IV I.

None of these four varieties correspond well to the songs of this Warbler on Mt. Monadnock as described by Thayer (Chapman, F. M., Warblers of North America. 1907, pp. 137–138).

My Warbler usually sang directly after feeding. He failed to sing after 15 of 133 morning feedings or 11 per cent, and after 21 of 68 afternoon feedings or 31 per cent (17 per cent of the total number). In the mornings he sang from 1 to 22 songs after feedings—an average of 4; in the afternoon from 1 to 15 songs—an average of 3. He sang shortly before 49 of the feedings.

His greater enthusiasm for singing before noon is shown by the 969 songs given in these 22½ hours in contrast to 316 in the 14 afternoon hours; i.e. he averaged 43 songs an hour in the mornings and 22.5 an hour in the afternoons. Probably the difference would have been even more marked if I had reached the nest before dawn, instead of between 7 and 8 o'clock. The amount of singing each day did not vary much, averaging between 40 and 50 songs an hour in the mornings, except on the 25th when they averaged only 26.

There was not a single hour when there was no singing. The number of songs per hour ranged from 8 to 42 in the afternoon (except from 12.40–1.40 on June 30 when he sang the greatest

number of all—84 songs), and from 18 to 78 in the mornings. The average number of songs, when the whole week is considered, decreased each hour in the morning from 7.15 to 12.15 as follows: 57, 49, 41, 37, 34.

Brooding. The length of the broodings depended on the visits of the male, since he never delivered any food to his mate. Harding reports that a male of this species occasionally fed the female as she brooded (Bull. Northeastern Bird Banding Ass'n., II, 1926, pp. 66–68). Only the last of the 22 broodings was terminated by the female independantly of the arrival of the male—on June 28 at 9.00 she left after a 6 minute stay. Once she refused to leave immediately; June 25 at 10.08 she had settled down and 9 minutes later her mate came to the west edge of the nest with an insect, but she remained motionless; he flew away returning in about a minute from the east side, whereupon she left. She did not brood again until 10.54. On June 24 he came to feed after she had been on the nest only two minutes; in this case she left but returned a minute later and resumed brooding without feeding. Although disturbed four other times after two-minute broodings, she never again returned without bringing food.

Broodings varied from 2 to 20 minutes in length (except for one of 41 minutes on the afternoon of June 26 during and after a rain); the average time was 9.1 minutes. The percentage of time spent in brooding was 22.2 on June 25 and 18.9 June 26. She brooded after half the feedings on June 25 and after 22 per cent of them the next day.

On June 24 the female faced east when she brooded the first two times, but always after that she faced west. She shaded from the sun only once—on June 29 from 9.41 to 9.47; the nest was well protected since it was in the woods and also because of the large leaves just above it.

Feeding. The male fed 201 times, the female 193, an average of once every 5.6 minutes. The average rate during the first four days was once every 7.3 minutes, during the last three days once every 4.6 minutes. The male increased his rate one fourth during the later part of nest life, but the female doubled hers. His rate for the first four days was once every 12.4 minutes, for the last three once every 9.8 minutes; her rate was once every 17.6 and 8.7

minutes during the same periods. From the 24th to the 27th he fed 82 times, she 58; on the 28th and 29th he fed 68, she 65, but on the 30th he fed 51 and she 70.

In both the nests watched by Mousley (Auk, XLI, 1924, pp. 263–268) the males did only a small proportion of the feeding: In one case 16 times in comparison to the female's 46 in 15½ hours of observation from hatching to the age of five days; in the other only once in contrast to his mate's 349 trips in 14 hours with 7 and 8 day young. The two young in the first nest were fed once every 15 minutes, the four in the second once every 2.4 minutes—a truly remarkable record for the mother bird.

Both parents at my nest were apt to give several feedings in quick succession and then to stay away for a while. This tendency is shown by the following sets of figures: the average interval between the male's feedings was 10.9 minutes; yet 122 intervals were shorter—from 1 to 10 minutes, and only 74 were longer—from 11 to 52 minutes. The average interval for the female was 11.3 minutes; 123 of these ranged between 1 and 11 minutes and 66 between 12 and 47. With the male 62 intervals were only 1 to 5 minutes long and with the female 66. With both birds about half the intervals fell between 2 and 7 minutes, 91 with the male, 86 with the female. Possibly this grouping of feedings is an adaptation to the brooding of the female; if the male came punctually every 10 minutes he would continually disturb his mate at her occupation of warming the young.

As to the time spent at the nest in feeding and inspection, I measured it with the stop watch in 57 cases with the female and 75 with the male. With the former the periods during the first four days varied from 10 to 34 seconds and averaged 16.4; during the last three they ranged from 3 to 16.5 and averaged 8.1. The male stayed at the nest during the first four days from 2.5 to 21 seconds, averaging 12.1 seconds; during the last three, he stayed from 3 to 28 seconds, averaging 10.5. It is interesting to note that the female near the end of nest life made her visits twice as brief and twice as numerous as they had been during the early part. The speeding up on the part of the male was much less noticeable.

Usually the parents brought but one insect at a time. Small green caterpillars were recorded frequently, other morsels being

white grubs, white moths and a crane fly. The male often gave larger insects than did his mate.

When coming to feed, the female usually reconnoitered the situation in the trees before going to the nest, but the male came headlong. She often left by mounting the tree next the alder, but he never did this. As a rule, both birds came to the east rim of the nest, and after feeding, hopped up on the branch a few inches above the nest, sitting there a moment or two before leaving. Twice, however, the female slipped directly out to the east, and 13 times the male did this. Fourteen times the female came to the west side of the nest and 46 times the male did the same. Occasionally they flew away to the south, west or east, but usually they left towards the southeast or southwest. Once, on June 30, the male came and left in an entirely new way, namely the north.

Other Activities of the Parents. The female was considerably more timid than her mate. Even he was not as fearless as the Myrtle and Magnolia Warblers whose nests I have watched, for when I moved within 15 feet of the nest he refused to feed the young. He almost never gave any alarm notes, but his mate did so quite often.

She stayed in the vicinity of the nest much of the time, but the male after feeding once, twice or several times went entirely out of sight. Mousley (Auk, XXXVI, 1919, p. 348) says of the Black-throated Blue Warbler that he has "generally found him to sing much further away from the nest than any of the other Warblers." The "singing trees" of these birds were 50, 90 and 100 yards away from the nest, while the furthest "singing tree" of any other of the 42 birds observed by this writer was 34 yards.

As to the sanitation of the nest, both parents both carried away and ate the faecal sacs throughout the week. Twice (June 26 and 30) the male faced the situation of two sacs at one time; in both cases he ate one and carried away the other. At other times I could see no particular reason for his eating them. It is easy to understand why the female should do this as a matter of convenience when she intends to brood, but not clear why the male should have adopted the practice. With this pair the male devoured 13 sacs and the female 6 during the period of observation. In only a few instances could the disposal of the other sacs be determined; these were wiped off on branches of trees.

The female spent but little time cleaning the nest from parasites; four times she seemed to be thus occupied for periods of a few minutes on June 25, 26 and 27.

The Warblers were seldom troubled by neighbors. The female drove off a Black and White Warbler that came too near, but was seemingly overawed by a Solitary Vireo that seated itself above the nest; as soon as the male appeared, the Vireo had to leave. Once the male came to feed but waited for a full minute before going to the nest, possibly because of a Crow's loud cawing nearby.

Development of the Young. On June 24 the wing quills were one fourth inch long; on the 25th about one half inch, on the 27th an inch. On the 29th the little birds were feathered out as the Magnolia Warblers had been when 8 days old (Wilson Bulletin, XXXVIII, 1926, pp. 185–199). It was not until the 30th that I heard any sound from them, but on account of a severe storm I had not been able to visit them on the afternoon of the 29th. Although I tried to distinguish the sexes on the last day I was not sure of being able to do so; perhaps if I had taken the young in my hand I might have done it, but I was careful not to disturb them for fear of making them leave prematurely.

The Last Day. On June 30 the nest was overflowing with the pretty babies, one being perched on top of the others. Still on occasion they could disappear entirely into the nest. For the first time they were vociferous at most of their meals and also shortly afterwards, but seldom made a sound between their parents' visits. Fluttering the wings was also a new development; sometimes a nestling fluttered but made no sound. They stretched and preened and moved about and sometimes picked at each other's faces.

The female's 70 trips were distributed each hour beginning at 7.40 thus: 8, 10, 6, 6, 4, 10, 12, 5, 5. The hourly distribution of the male's 51 meals was as follows: 7, 6, 7, 5, 2, 9, 1, 5, 5. During the last half hour each brought 4 meals.

Near the middle of the day the young grew more and more demonstrative, chipping and fluttering at the appearance of the parents; sometimes they nearly left the nest in their excitement. Twice little birds almost fell out but managed to right themselves. At 2.12 one got on the edge of the nest, but quickly returned. At

2.54 they crowded and pushed and nearly tumbled out, but afterwards all subsided for a nap.

Finally at 4.15 a baby hopped out, shook himself as if greatly relieved to have escaped such crowding, then hopped about from twig to twig. He gave a little flight, saying *chip chip.* It was interesting to see how perfectly he could manage himself in the entirely new actions of hopping and flying (for a few feet), making no mistakes in judging distances. The mother came, viewed the scene and left. The adventurer hopped and hopped, then sat on a branch a yard from the nest and preened himself, remarking *chip,* while the others struggled about. Then he hopped further.

At 4.20 the male fed the nestlings. The outsider began to call, then flew across a tiny brook, twittering and cheeping. There was the greatest difference between the quiet young in the nest and the vociferous infant outside; evidently the act of leaving the nest had set in motion the food calling instinct. Almost constantly he clamored *tidderdée, tidderdée* as he wandered about over the dead leaves. The parents, however, were more interested in the nestlings than in this noisy child; it was not until 5 o'clock, after 7 meals had been given to the stay-at-homes, that he was served. He kept on demanding sustenance at the rate of 37 three-syllabled cries a minute, while the others were given four more meals.

I started to pack up my belongings and made a noise with the canteen, whereupon the little bird instantly stopped his cries. I went to look at him and both parents scolded, especially the male. I wished to catch him to examine him carefully and also see the reactions of his parents, but he hopped along over to the nest and clambered up a dead branch near it. Fearing to disturb the whole family, I left.

The next morning the nest was empty and the birds nowhere to be seen. I regret that I did not find the nest early enough to have studied it from the hatching of the young; but it was a gratification to have watched the departure of one little bird. Enough time was spent in observation to give a clear and consistent picture of the course of the later two-thirds of the nest life.

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FAVORITE COLORS OF HUMMINGBIRDS.

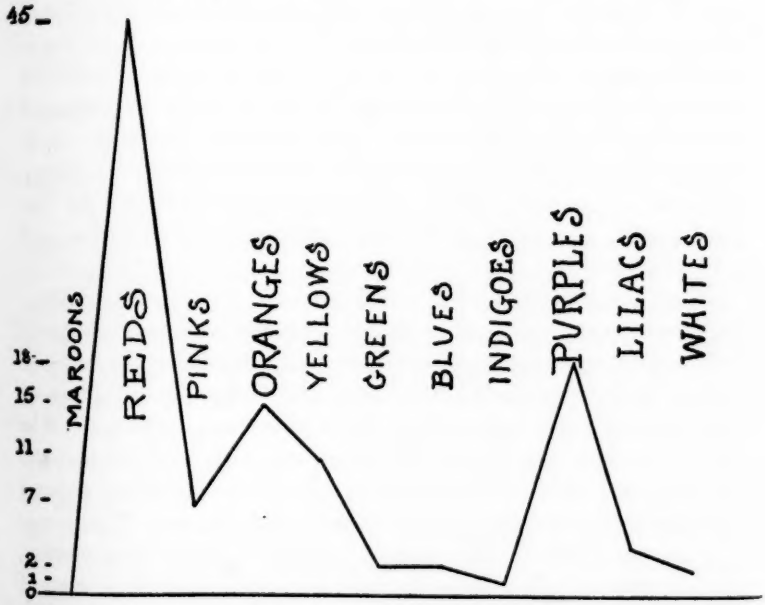
BY A. L. PICKENS.

THAT red is a highly attractive color to Hummingbirds is common knowledge among ornithologists. Any one can easily convince himself of this by experiments with red tissue paper bells, streamers of cloth hung in the bushes, or even wrapped about sticks and placed among the limbs. Coues, in 'Birds of the North-west,' following Holden, tells of Hummingbirds in the Black Hills being attracted to a piece of flesh thrown into a small dead tree from a Hawk's body that was being skinned.

Finding oranges and purples highly attractive to these nectar-seeking birds naturally leads one to further inquiry. Living near the southern Appalachians, where we have the most remarkable mingling of biological zones in the Eastern States, I began cataloguing floral species in the vicinity of my home. About five hundred plants were tabulated of which upwards of one hundred were introductions that had become naturalized. I also ran a floral calendar recording the first appearance of flowers, and was surprised to find the season of first appearances ran from December to September, October and November being well supplied with flowers that had appeared earlier. Classification by color best suited my purpose, and roughly following the spectrum I divided my finds into maroons, reds, pinks, oranges, yellows, greens, blues with indigoes, purples including violets, and whites. Yellows, blues, purples, and whites, all began in December and January. Pinks and maroons came in March, while the high season and first appearance of greens came in April. All these colors except maroon had fresh floral species to show even in the last month, September. Orange and red, however, with the elimination of the highly erythrophyllic red maple, appeared in April and brought fresh species up to July and August respectively. Hummingbirds appear in this vicinity in April and depart in September, lingering only, in my experience, where an abundance of garden flowers is available until October 5, and usually rare in the open country by September 20. Reds opened with the largest

number and declined toward the end of their season as thicker foliage shut off the light. Oranges opened with one or two and increased in number until their last month, which showed most new arrivals. I secured a list of the same colors from the northeast and found a similar graph as to appearances of fresh species and numbers, with some to be expected seasonal delay.

Barring the previously mentioned red maple, and some introductions from abroad, all these red flowers showed an approximate tubular flower, the form preferred by Hummingbirds. This was true of the majority of orange flowers. Nowhere in eastern North



GRAPH by COLORS of 110 SPECIES of FLOWERS VISITED by HUMMING BIRDS

America have I been able to find a true bird flower outside of these two colors, but to bird-insect flowers this does not apply. I decided to make a graph following the spectrum roughly with species of flowers Hummingbirds had been seen to visit both in the open and in gardens. The final list represents 110 species of which 45 are red and 19 purple while oranges, including here those

red and yellowish bicolored flowers which often appear orange at a short distance number 15.[1] My experience had led me to expect this result. But how explain it? In popular nature literature, and in private conversation, both, it has been suggested that it was the admixture of red in the two other colors. The old idea of Brewster which considered red, yellow, and blue as the primary colors lends strength to this, as does the mixing of pigments today. But Maxwell thinks red, green, and blue the primary colors, while Young, and also Abney support red, green and violet. Purple in its broad sense of course includes violet and a portion of the adjacent indigo in the spectrum, as well as combinations of red and blue which approximate these parts of the spectrum. It is not the purpose of this paper to deal with such points as dispute the occurrence of a true blue in the floral kingdom, or the occurrence of a true purple in the spectrum. That a certain shade of purple cannot be produced by any one set of light wave lengths, but only by combining violet or blue with red, does not eliminate the fact that purple as usually understood includes not only mauve and lilac but violet.

That the eye of the bird leaps through the spectrum hitting only in intense spots is unthinkable. The evolutionary scheme of colors with our present knowledge of all involved gives no help. Augustin de Candolle's scheme of dividing flowers into blues or cyanics, and yellows or xanthics, with true red as a neutral, seems to show one thing that we would expect, especially with some of the modern limitations placed on the theory, *i.e.*, the more tropical xanthics appear to supply more Hummingbird flowers. The coloring of vegetation in the tropical regions is much more intense, and Hummingbirds making up what is overwhelmingly a tropical family may naturally be expected to be instinctively on the outlook for intensely colored flowers. At some season of the year nearly every species of these birds is found in the tropics, and in red Hummingbird flowers, my present information points to a choice of the scarlet of the xanthic side rather than the crimson of the cyanic side. The overwhelming number of tropical species of *Trochilidae* can be appreciated only by comparative study. Colom-

[1] A vari-colored, indefinite flower included in the list, could not be assigned strictly to any one color scheme shown on the graph.

bia is their great center, containing almost a third of the known species. As we work out in any direction from this region there is a noticeable decrease in number of new species found, until Argentina on one side, and the United States on the other, probably show no species not encountered nearer the equator, at least at some time of the year.

It is easy to perceive that Hummingbirds prefer the intensity of color shades rather than the paleness of color hues. Take for example the drop from reds to pinks certainly containing red and from purples to lilacs. Once perceiving this I feel we are on the right track to a solution of the problem, which appears to hinge largely on the matter of visibility by day and concealment at night, the same problem that we have between day-flying and night-flying insects. Lovell in 'The Flower and the Bee' considers red, blue and purple favorite colors of the long-tongued species. Plateau, as I find in Kellogg's 'American Insects,' in his experiments contradicted the classic color experiments of Lubbock and apparently showed that smell, or some sense other than sight, leads bees to flowers. Butterflies too seem to prefer the intense shades as for example the rich orange of butterfly weed, *Asclepias tuberosa,* sometimes visited by Hummingbirds. Whether or not insects perceive color need not enter into the question. If they merely see colors as shades of grey, still pink, true yellow, light blue, lilac and white would be highly visible at night expecially by moonlight, while red, orange, deep blue and purple would not be perceived, and the night moths would leave their nectaries more nearly full. Such a fact must eventually impress itself upon the feeding instincts of the Hummingbird.

The question is one that cannot be decided by mere rule of spectrum or pigments. There is so to speak a relativity of colors. A white wall, a snowy mountain, and an icy lake are to the careful observer, watching late in the evening, a soft pink. A white wall seen through a hedge may appear soft blue, as do certain indoor and ice-plain shadows, while an asphalt pavement under certain lights gives a dark blue.

Red being the complement of green is the most conspicuous color that a flower can show. In nature, as in commerce, it has good distinctive value against almost any other background.

Most conspicuous by daylight, it is quite invisible at night and in deep shadows. This makes it a very valuable color for flowers to be pollinated by color-perceiving honey-seekers. Pink while visible at day unless of a deep shade is also highly visible by night.

Orange, while not so brilliant, is more showy in deeply shaded swamps and woods than is red, and where deep enough in shade is also invisible at night. Orange will shine through a series of intervening shadows broken by sunlight shafts where red remains in obscurity. It is a valuable color for *Macranthera* growing on the edge of Mississippi bay swamps so dark that Owls call in the shadows at midday, and for jewel weed (*Impatiens fulva*) frequently found along the edge of shadowy thickets in Atlantic slope swamps, where it is frequented by Ruby-throats. Further west, on the sunny prairies and the less forested Pacific slopes it probably plays less part in the luring of pollinators of the feathered type.

Yellow, while brightest of colors, and popular with insects, some if not all of which probably perceive by shades of gray, is too near green to be highly noticeable to a color-perceiving eye, and it is also too often used in light and foliage trickeries to trust. Next to white, it appears most visible at night in moonlight, unless golden or orange-tinged.

Green flowers are too inconspicuous among foliage. In certain contrasting desert backgrounds, or on sere dry-season prairies it should have value. Thus, while no green Hummingbird flowers are known in the East, *Nicotiana paniculata* one of the greenest large flowers I know, is much frequented in the west during the dry season at least.

Blues when too dark to be visible at night are almost invisible by day. Of all colors blue approaches white nearest in its lighter hues and black in its darkest shades. Prismatically it and yellow produce white, a fact long appreciated by the laundress who whitened yellow linen with bluing. The little African lobelia, *L. erinus* is hard to distinguish despite its massed growth, and at the width of a street away one finds himself wondering if it has not withered even with the sunlight directly on it, and when the shadows of the trees drop on it it is equally obscure. Rood in his 'Textbook of Color,' following Bezold, rejects indigo and inclines to ultramarine as a name for the spectral region next to violet.

Now Saunders in 'With the Flowers and Trees in California' tells of an artist on the desert who insisted that the blooms of the indigo bush (*Dalea spinosa*) were preferably designated as ultramarine. To me one of the biggest surprises of the summer desert has been this intensely blue flower on its dry thorny gray branches, so vivid nearby, and yet so obscure even in bright sunlight when seen at a short distance. Against a certain background it might be fairly conspicuous, but I know of dark blue bird flowers only from the literature.

Purple has, when properly placed, good visibility by day and obscurity at night. It is better fitted for producing bird flowers in the sunnier regions of the west I should think.

Lilac would probably show up better in the Southwest than in the East, being visible at night and Costa's Hummingbird being largely a twilight feeder.

The disadvantages of white are obvious, though the white day lily (*Funkia subcordata*) as I recall is visited by the Ruby-throat, and I think may even sometimes yield to the bird's gently inserted beak in the loose petals of the bud, thus beating the night moths in their own field. By day, however, certain leaves, such as those of mandrakes, give white reflections, at a distance appearing like beds of flowers, and such trickery might have a deterring influence in the development of so symbiotic a relation as that of pollination by animals.

But we must not lose sight of the keen form perception of birds in work of this kind. The Ruby-throat knows well the relation between bees and honey or nectar, and soon finds the sap-flows with their dark back-grounds and swarming hosts of bees, and then peers curiously into the door of the bee-hive evidently taking it for a similar sap-flow because of the presence of the insects. It pauses and examines the floating specks of soot in air perhaps taking them for spiders, and one hovered near a smoker's pipe one day probably taking the blue wisp of smoke for a spider-web. The young Anna, still being fed by the mother may be seen exercising and training the tongue on green pepper-tree leaves, and the older one will rush back and forth through a swarm of gnats or midges as if to take some as Swallows do. In the forest the different species quickly note the gleam of eye or of field-glasses and curiously investigate.

With such perception in use the visits to the neglected colors in garden hybrids of varied colors will be higher than among wild flowers. Dahlias, petunias, snap-dragons, pentstemons, nasturtiums, gladioli, zinnias, pansies, morning-glories, and amaryllis, these ten flowers, so often planted in beds of massed colors, I have preferred to consider in terms of their ancestral colors. The young Anna coming to the antirrhinum bed will try a red flower, feeling around the seeming openings in the calyx, and perhaps finally discover how to get into the mouth locked for sake of the bees. Once in, it is easy to get into the white phase standing near.

Obviously a graph, formed from a series of short notes in different localities, is much nearer the truth than one formed by long observation in a single spot if we merely use species of flowers. The casual visits of a dabbing nature must eventually draw a purely local list of neglected colors very close to, or beyond, the number of red species, which are decidedly limited in any one locality. Such a condition can be fairly tabulated only by recording by color the actual number of visits to the flowers, in a locality fairly representing the various colors.

Complete lists would probably show red, the sharpest contrast to green, a favorite everywhere, with orange in some favor in tree-shaded regions and a neglected color like green rising in sun-browned territory.

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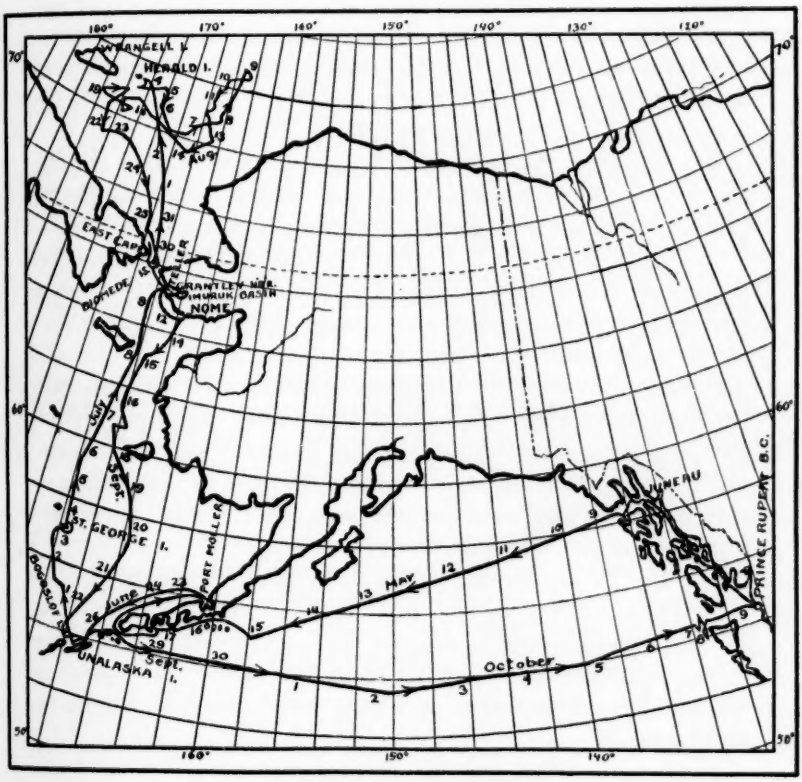
WATER BIRDS OBSERVED ON THE ARCTIC OCEAN AND THE BERING SEA, IN 1928.

BY F. L. JAQUES.

IT was the writer's good fortune during the summer of 1928 to be a member of the Stoll-McCracken Expedition of the American Museum of Natural History to the Arctic Ocean. The expedition left Prince Rupert, B. C., on May 1, 1928, on the schooner



Route of the Voyage, with Dates.

Morrissey, under command of Captain Bob Bartlett, arriving at Juneau, Alaska, May 4, via the inside passage. After leaving Juneau the real work of the expedition began.

Three days were spent at Lisianski Strait, Chichagof Island. On May 9 we passed out through Cross Sound into open water, crossing the Gulf of Alaska to the Shumagin Islands, which were reached on the fifteenth. Passing through Unimak Pass we arrived at Port Moller, on the Bering Sea side of the Alaskan Peninsula, where the party remained from May 22 until June 23.

After leaving Port Moller we sailed out along the Aleutian Islands. A brief stop was made at Dutch Harbor, Unalaska Island, and two days were spent at Kashega Bay, toward the western end of the same Island. From here we left the Aleutians and passed northward through Bering Sea. After stopping at St. George Island in the Pribilof group, July 4, we arrived at Teller, Alaska and Grantley Harbor on July 10.

Here we were delayed by a broken propeller shaft until July 27, and a brief stop was also made at the Little Diomede in Bering Strait. We entered the Arctic Ocean July 30.

On August 4 we were but a short distance off Herald Island, but ice prevented a landing. From that time until August 23 we were constantly in touch with the ice, reaching 72° 32′ north latitude, 166° west longitude, on August 9.

From August 23 until we left the Strait storms were the rule. On August 26 the western half of Bering Strait was closed with ice that had been driven down from the northern shore of Siberia. East Cape and the mountains back of it were covered with new snow. September 7 we anchored again at Teller, after having been at sea constantly since July 27.

Leaving Teller September 12, and Nome September 13, we landed on Bogoslof, a volcanic island in the Aleutians, September 23, Dutch Harbor, September 26, and the whaling station on Akutan Island, September 28. Unimak Pass was cleared early on September 29, and we arrived at Prince Rupert, British Columbia, on October 9.

The accompanying map will aid the reader, who should know not only where we were, but where we were not.

Colymbus holboelli. HOLBOELL'S GREBE.—Present at Prince Rupert April 25 to May 1. Common at Wrangell Narrows, May 3. Several were seen on fresh water ponds near Port Moller, June 4 and 20.

Gavia immer. LOON.—Abundant on the inside passage, mostly in

winter plumage May 3. Most were in the summer plumage at Lisianski Strait May 7 and 9, where their call was frequently heard. Several were seen flying northwest some miles offshore May 9.

Gavia adamsi. YELLOW-BILLED LOON.—One bird of this species was seen in the salt water channel between Grantley Harbor and Imuruk Basin near Teller, July 21, and probably two others. One was seen at sea north of East Cape. Two birds which I believe were this species were seen May 5 near Juneau.

Gavia pacifica. PACIFIC LOON.—It proved difficult to distinguish between this bird and the Red-throated Loon. All that were positively identified, usually by the note, were Pacific Loons. It was common about the Port Moller region June 1 to 23, usually flying high over the tundra. Present on the Tuksuk and Imuruk Basin, and undoubtedly bred abundantly on the delta of the Agiapuk River, Imuruk Basin, near Teller. Often seen at sea.

Lunda cirrhata. TUFTED PUFFIN.—This bird was first seen on Cross Sound, southeastern Alaska, May 6. Present in the Gulf of Alaska, and numerous in Unimak Pass, May 20. Numerous near Unalaska, June 26. Breeding on islands off Kashega Bay, Unalaska Island. A few dead were found on Bogoslof Island, September 23, which would indicate the presence of breeding birds. Although an abundant breeder at St. George Island it is outnumbered there by the Horned Puffin about ten to one. Abundant and breeding on the Diomedes, being slightly outnumbered by the Horned Puffin. One bird was seen at 70° north latitude. No others were seen much north of Bering Strait. On September 4 they were still as numerous on the Diomedes as on our previous visits, breeding high up on the cliffs. I saw no young birds or birds in winter plumage. Present about Sledge Island, September 12. On October 1, birds without the white cheek patches were seen in the north Pacific. Seen practically everywhere throughout Bering Sea and the North Pacific, but not in the bays or inshore except near its breeding islands.

Fratercula corniculata. HORNED PUFFIN.—First seen at False Pass, Alaska Peninsula, May 18. Seen about Port Moller sparingly, and about Unalaska Harbor and Kashega Bay where cliffs suitable for breeding are present. Far outnumbering the Tufted Puffin on St. George Island, and probably on the Diomedes, though this impression may be deceptive, as the Tufted Puffin ranges farther off shore and is more inconspicuous on the cliffs.

The Horned Puffin was seen at sea in increasing numbers north of St. George Island. Colonies were found on Grantley Harbor near Teller, and along the coast, as, for example, at Cape Prince of Wales. Several were seen near Herald Island. Since we could not approach nearer than six or seven miles and since the bird does not commonly range far off shore this would seem to indicate a considerable colony there. No young were seen about the Diomedes, September 4 when the adults were still abundant and visable on the cliffs. Among the Alcidae of northern Bering Sea it shares

only with the Pigeon Guillemot the habit of breeding deep in the bays. It was not seen much south of Nome on our return.

Phaleris psittacula. PAROQUET AUKLET.

Aethia cristatella. CRESTED AUKLET.

Aethia pusilla. LEAST AUKLET.—The Auklets were first seen as we approached St. George Island, where they were abundant, the Least far outnumbering the others, while the Paroquet was the least common. The Paroquet and the Crested I found along the cliffs while the Least bred abundantly inland.

On the Diomedes July 27, 28, and 29, the abundance of Auklets defies description. At dusk, which comes late at this time of year, the air about the Islands as far up as one could see was filled with whirring Auklets, mostly singles or small flocks, many thousands being in sight at one time. In the morning the sound of the wings and the chattering made a roar comparable to the sound of a heavy surf. This morning flight is over the sides of the Islands as high as the birds can be seen. It continues in lessening numbers until it ends abruptly about 12 o'clock noon. In the afternoon birds may be seen flying in flocks low over the water surrounding the islands. At a mile from land the numbers are not nearly so great, and they are rarely seen at sea far from the Islands. Where the immense hordes come from that gather at dusk it is difficult to say.

On our return to the islands August 27 they were as abundant as before, with the same evening and morning flight. September 3 and 4 found the birds much less numerous, and there was no noticeable evening and morning flight, though there were many birds in the water. September 7 found their numbers greatly reduced.

The Crested Auklet seemed the most abundant, followed by the Least. All three species were breeding over the entire suitable portion of the Islands. In the case of the Little Diomede the whole island was used, except for the sheer rock cliffs at the base of the slopes, which were used by the Murres and the Pacific Kittiwakes.

On August 14, at 69° 40′ north latitude, several flying flocks of Auklets were seen. All followed the same course, too far from the vessel to permit identification. Two, however, were Least Auklets, but I am quite sure other species were present. Several singles were seen on August 23 and 24 at points almost as far north.

Synthliboramphus antiquus. ANCIENT MURRELET.—Several were seen on the Pacific side of the Alaskan Peninsula near Belkofski, May 17 and 18. Also observed in southeast Alaska.

Brachyramphus marmoratus. MARBLED MURRELET.—The only good identifications were in southeast Alaska.

Brachyramphus brevirostris. KITTLITZ'S MURRELET.—One collected at Port Moller June 6.

Cepphus mandti. MANDT'S GUILLEMOT.—The first were seen August 2 above 69° north latitude, and the last August 23 near the same place. They were common north of this,—most abundant near Herald Island,

which during the entire time we were in the Arctic ocean was surrounded by ice. It is found anywhere at sea, but is more numerous at the edge of the ice. This bird is easily distinguished from the Pigeon Guillemot, the white wing mark being unbroken, while the lower wing surface is white, graduating smoothly to black at the tips of the primaries and secondaries,—a very good field mark. None were seen except in adult summer plumage.

Cepphus columba. PIGEON GUILLEMOT.—Present throughout southeast Alaska and near the Alaska Peninsula. This species is rarely seen far off shore, in which it differs markedly from Mandt's Guillemot. It breeds on cliffs far into bays and along the coasts, sharing these localities with the Horned Puffin. None were seen on St. George Island. There were colonies at Moller Bay, Unalaska Island, Grantley Harbor, and the Diomedes. In the Diomedes this bird is the least numerous of the Alcidae. Grown young were seen here on August 27 and after.

Uria troile californica. CALIFORNIA MURRE.

Uria lomvia arra. PALLAS' MURRE.—I found the Murres difficult to separate in life. Of 25 skins collected at the Diomedes for a Museum group one was that of a California Murre. Dead California Murres were found on Bogoslof Island September 23, which would indicate their presence earlier as breeding birds.

In southeast Alaska in early May many Murres were still in winter plumage, or partially so. They were present about the Alaska Peninsula and numerous near Unimak Pass, May 20. This was due no doubt to the presence of suitable breeding islands rather than to any migration through the Pass. Many were seen at favorable localities near Akutan, Unalaska, Umnak and Bogoslof Islands, June 26 to 30. They were very abundant at St. George Island, and present throughout Bering Sea. None were seen inside the entrance to Port Clarence near Teller. Many bred at the Diomedes and no doubt at Herald Island, where large numbers at a distance of six or eight miles offshore would indicate an immense breeding colony.

Off the Diomedes August 27 several half grown young were seen, each accompanied by a single parent. At this time ice surrounded the islands and we were unable to approach, but on September 3 and 4, no Murres could be seen on the cliffs. On September 4 we saw the first grown young or adults in winter plumage. After leaving the Diomedes, September 6 none were seen until September 18 near Nunivak Island. On September 21 one half-grown young with a single parent was seen at a point ninety-seven nautical miles from the nearest land, or 125 miles from St. George Island, where it was probably hatched.

Near Prince Rupert, B. C. October 9 the Murres were again all in winter plumage.

Stercorarius pomarinus. POMARINE JAEGER.—This Jaeger was first seen at 60° north latitude in Bering Sea, July 6, and again July 30 north of Bering Strait. North of the Strait it was common or abundant, sometimes the most abundant bird. They constantly harass the Kittiwakes. I saw one attack a Tufted Puffin, which it seemed to be trying to keep under water.

After we left the Straits, September 7, only three birds were seen,—one off Nome, September 14, and two about 100 miles off the Queen Charlotte Islands, October 5, accompanying a flock of migrant Kittiwakes.

A small proportion of the birds were in the dark phase. Their flight did not seem as agile or graceful as that of the other Jaegers. I never saw it near land. It was entirely absent from the immediate vicinity of the Diomedes, though common a short distance off shore.

Stercorarius parasiticus. PARASITIC JAEGER.—Common along shore and over the tundra north of Port Moller, where it was breeding in June. Present, but not common in the Teller region. Light and dark phases in about equal numbers. A wonderful flyer.

Stercorarius longicaudus. LONG-TAILED JAEGER.—First seen in Bering Sea, near St. Lawrence Island, July 8, this Jaeger was a common breeder in the Teller region. A few were seen in the Arctic Ocean until August 7, and north to Herald Island.

Pagophila alba. IVORY GULL.—Only three birds, all adult, were seen. These were in the vicinity of Herald Island.

Rissa tridactyla pollicaris. PACIFIC KITTIWAKE.—Present in the Gulf of Alaska and everywhere at sea. Common in Moller Bay till about June 1. Common along the shore of Bering Sea, June 15 and later. Many, both adults and immature, on mud flats north of Port Moller, June 20 and 22. Very numerous near Unalaska, June 27. Not common in southern Bering Sea, but breeding on St. George Island. Common near St. Lawrence Island. Present in small numbers in the Teller region. Breeding abundantly on the Diomedes. Present, and sometimes abundant, throughout the Arctic Ocean.

No juvenile birds were seen in the Arctic Ocean. The year old birds on August 1 had fully banded tails, which were moulted from the center outward until on August 26 only the outer feathers retained the black. In marked contrast to these were the birds of the year, which were very strikingly marked.

These juvenile birds were abundant off the Diomedes, August 27 to September 6. Adults were not in evidence, except close in and about the nesting sites, where they were abundant. Juvenile birds were seen with the others south through Bering Sea. Present in the North Pacific. On October 5 many adults were seen in large flocks whose actions were entirely dissimilar to those of the Pacific Kittiwake seen at other places. These I assume were migrating birds.

Rissa brevirostris. RED-LEGGED KITTIWAKE.—First seen July 1 at 55° north latitude in Bering Sea. It was abundant about St. George Island and not seen much north of that.

Larus hyperboreus. GLAUCOUS GULL.—None were seen much south of St. Lawrence Island in Bering Sea. The Glaucous and the Glaucous-winged Gulls seem to be separated in Bering Sea by about five degrees of latitude, 58° to 63°. Between these points very few large Gulls were seen on either the north or southbound passage. Glaucous Gulls were seen sparing-

ly in the Arctic Ocean north to Herald Island. More common about Bering Strait. A few probably breed on the Diomedes, using flat-topped pinnacles for nesting sites. More abundant about Teller, but nowhere so numerous as is the Glaucous-winged Gull throughout its range.

Very few birds in the all white plumage were seen.

Larus glaucescens. GLAUCOUS-WINGED GULL.—Very abundant and very noisy at Moller Bay for several days about May 25. Abundant along shore and congregated on the tundra north of Port Moller during June. Many of these must be non-breeding birds. Present at sea, everywhere north to Bogoslof Island where it breeds. First seen at 58° north latitude on the return journey. Common everywhere thereafter.

During May the primaries of the immature birds were badly worn, and during early June the inner primaries of all the birds were being molted. During early October many of the immature birds have a distinctly marked cape, as if the molt had progressed from the rear to a point just forward of the wings, and stopped. This was conspicuous in a large proportion of birds.

There are a few birds about the southern side of the Alaskan Peninsula with wing markings somewhat intermediate between the Glaucous-winged and the Herring Gull, usually, however favoring the Glaucous-winged.

J. T. Nichols tells me that he saw no adult Herring Gulls when northbound on the British Columbia coast in early July 1926, but that birds intermediate between these and the Glaucous-winged were noted in the Gulf of Alaska and westward. July 5 on the British Columbia coast he noted an adult Glaucous-winged Gull with "the wing tip of a darker gray than the mantle, inclosing a conspicuous white mirror." To quote further from his journal, "The four days, July 7 to 10, from southeastern Alaska north to Cordova and west to Seward each day noticed at least one adult large gull with black on the primary tips. The amount of black seemed small, especially in a bird on the 7th, little more than an aberration of the Glaucous-winged Gull, which by the way as one sees it in the field is very like the Herring in every other way. There was another such Herring or Glaucous-winged, with a very little black, at Akutan, July 24."

Larus argentatus smithsonianus. HERRING GULL.—Common in southeast Alaska in early May. One immature near the Shumagin Islands. An adult was seen at Nome, September 13, and the species were common again as we approached the Queen Charlotte Islands on our return in October.

Larus argentatus vegae. VEGA GULL.—One adult with several immature, probably of this subspecies, seen near Teller, July 26.

Larus canus brachyrhynchus. SHORT-BILLED GULL.—Common in southeast Alaska May 3 to 5. Seen again at Moller Bay May 27. Common during June in the Port Moller region, where it probably breeds. They were found far back up Salmon Creek and over the tundra. These inland birds were all adults. A pair near some pools drove away every Glaucous-winged Gull which approached but I was unable to get them to

resent my presence in the slightest, and I never found a nest. Another pair I am quite sure had a nest on a tiny island in a fresh water lake, but I could not reach it. They seem curious and will usually come near, but in no case did they display any serious objection to my presence. It feeds along the beaches and tide flats, and seems an inoffensive bird.

Hydrocoloeus philadelphia. BONAPARTE'S GULL.—Present in southeast Alaska May 2 to 5. Three immature specimens only collected and about forty seen near Port Moller June 10. These birds were molting the body plumage at the time.

Rhodostethia rosea. Ross' GULL.—Two juvenile birds were collected August 16 and 19. Six others were seen August 18 and 21. All were north of 70°, in the neighborhood of Wrangell and Herald Islands, and seemed to be flying north. It would be difficult to distinguish the juvenile of this bird from that of Sabine's Gull in life unless the tail were spread. No adults were seen.

Xema sabini. SABINE'S GULL.—One adult was seen on Moller Bay May 23. Adults were seen on six days during August, and on September 2, in the Arctic Ocean and Bering Strait. One juvenile was collected August 22, south of Wrangell Island. Others were seen on that date, and on August 25.

Sterna paradisaea. ARCTIC TERN.—A common breeder in the Port Moller region. Present near Teller. Not seen in the Arctic Ocean until August 10, and from August 17 to August 22, mostly in the neighborhood of Herald Island and north of 70°. A few August 26 in Bering Strait, none thereafter.

Sterna aleutica. ALEUTIAN TERN.—Several hundred were seen at Port Moller, May 22 to 30. One or more were seen July 9 in Bering Sea near Nome.

Diomedea nigripes. BLACK-FOOTED ALBATROSS.—Seen every day off shore in the Gulf of Alaska and the North Pacific, both in May and in October. Ten were in sight at one time. They and the Fulmars may be seen flying on moonlight nights. One was seen off Unimak Island, on the Bering Sea side, June 25. The proportion of immature to adults was about three to seven.

Fulmarus glacialis glupischa. PACIFIC FULMAR.

Fulmarus rodgersi. RODGERS' FULMAR.—Fulmars were first seen in the Gulf of Alaska, May 12. From longitude 146 west they were abundant. Nearly all these birds were in the dark phase, occasional light birds were seen, as well as a continuous gradation in color from light to dark. There was also a great variation in the color of the bill in birds of similar plumage. On May 19 south of Unimak Island most of the Fulmars were in the light phase. May 20, on the Bering Sea side of Unimak Pass, found the light phase predominating. From Port Moller to Unalaska, June 23 to 26, the light phase was the most numerous.

In the neighborhood of St. George Island they were abundant. About one in a hundred was in the dark phase. They appeared, here, to be molt-

ing. I do not know whether or not they breed on St. George Island. All the birds seen in Bering Sea north of St. George Island were in the light phase. None were seen in Bering Strait or about the Diomedes, July 27 to 29.

They reappeared again in large numbers off East Cape, July 30 and 31. We did not approach near enough to East Cape itself to determine whether or not they were breeding there.

They were seen occasionally throughout the Arctic Ocean south of 71° north latitude. None were seen near Herald Island. On our return they were abundant south of 68° 30′ and in the vicinity of East Cape and Bering Straits. They are more numerous along the edge of the ice, particularly where tidal currents are present. Throughout the Arctic there is one dark bird to several hundred light birds. We saw them throughout Bering Sea on our southbound passage until our return to the vicinity of Unimak Pass, where there was a much larger proportion of dark birds. Off Sanak Island, September 29, all were in the dark phase. On October 2, farther to the eastward, there was a larger percentage of light birds. Throughout the North Pacific the proportion of birds in the dark phase was about 3 to 1, with, as before, a continuous gradation in color.

The birds in the Arctic and about Bering Strait seem larger, more uniform and whiter in marking. About St. George Island there were a few with almost clear white upper wing surfaces, with dark tips. The lightest birds of the Pacific do not seem as white as the birds of the North, having usually less white on the lower wing surface.

This distribution of light and dark Fulmars agrees in general, but not in all particulars with the observations of Nichols in 1926 (Auk, 1927, XLIV, pp. 326, 328).

On windy days, when flight is much easier for them, the Fulmars come close in to the ship, and are much more in evidence than in calm weather.

On several occasions I have seen a Fulmar and a Black-footed Albatross, flying close together in a high wind. Using the same unseen forces of wind and wave, they follow an identical course for a considerable distance, each duplicating the slightest movement of the other,—movement suggested by conditions peculiar to the spot and the instant, and giving us some idea of the delicate dexterity with which these birds use the aids to flight at their disposal.

Puffinus griseus. SOOTY SHEARWATER.

Puffinus tenuirostris. SLENDER-BILLED SHEARWATER.—Shearwaters were present in the North Pacific on both passages, and abundant about Unimak Pass in May and June. They (probably all *tenuirostris*) were extremely abundant near Unalaska Island, June 26 and 27, when they appeared to be moulting. Numerous feathers, which included the flight feathers, were on the water, and the birds had a very bedraggled appearance.

Shearwaters were present throughout Bering Sea, very abundant in Bering Straits, July 27, and off East Cape, July 31. Two were seen at 70° and 71° north latitude respectively, and they were extremely abundant on August 23, 24, 25, 30, and September 1, 2, and 4 between 69° 30′ north

latitude and Bering Strait. On our south bound passage Shearwaters were present in small numbers in Bering Sea, more numerous near Unimak Pass, though not so plentiful as in May. Birds, probably *griseus*, were seen July 31 near East Cape and in October near the Queen Charlotte Islands. Many others were probably of this species but *tenuirostris* is no doubt much the more numerous.

The Shearwaters never range close to the ship as do the Fulmars.

Oceanodroma furcata. FORK-TAILED PETREL.—Present in the Gulf of Alaska in May. Several in Bering Sea north to 56°. Petrels were first seen on our return at the same latitude, but identification was not satisfactory, which is true of a number of Petrels seen in the North Pacific in October.

Phalacrocorax auritus cincinatus. WHITE-CRESTED CORMORANT.—On May 16 and 17 several Cormorants with thick short necks, and white on the head, were seen back of the Shumagin Islands and near Belkofski on the Alaska Peninsula. These could hardly have been other than the White-crested Cormorant. They were present September 26 and 27 near Unalaska.

Phalacrocorax pelagicus pelagicus. PELAGIC CORMORANT.—Cormorants, probably this species, were numerous in southeast Alaska. They were seen occasionally north to Bering Strait. Points of most abundance were Unimak Island, May 18, and Sledge Island near Nome. They were breeding in small numbers on the Diomedes, seeming to be more numerous on our later visit, September 3 and 4.

Phalacrocorax urile. RED-FACED CORMORANT.—Seen May 22 near Port Moller. Found breeding on St. George Island, July 4, and with nearly grown young, still in the nest, on Bogoslof Island, September 30.

Mergus americanus. MERGANSER.—More numerous in southeast Alaska in early May than the Red-breasted Merganser. Americanus was present near Port Moller in late May and June, and abundant on King Salmon Creek north of Port Moller in June, where it was found in flocks and in greater numbers than any other duck. The birds were mostly adult males, while one collected was a male in immature plumage. Possibly these birds were all males. There was no sign of breeding.

Mergus serrator. RED-BREASTED MERGANSER.—Present in pairs in King Salmon Creek near Port Moller after June 11, possibly breeding. One seen June 29 at Kashega Bay, Unalaska Island.

Lophodytes cucullatus. HOODED MERGANSER.—One pair in southeast Alaska.

Anas platyrhynchos. MALLARD.—Present in southeast Alaska, and a common breeder in the Port Moller region.

Nettion crecca. EUROPEAN TEAL.—Three were seen at Kashega Bay, Unalaska Island, a pair and a single female. Undoubtedly breeding.

Nettion carolinense. GREEN-WINGED TEAL.—Present on King Salmon Creek, Port Moller region, where it was breeding. This was just 280 nautical miles from where the European Teal was found breeding. One *carolinense* was seen at Teller.

Dafila acuta. PINTAIL.—Pintails were seen in southeast Alaska, May 3. A common breeding bird about Port Moller in late June. One seen near Teller in July.

Marila marila. SCAUP DUCK.—Common about two freshwater lakes at Port Moller in early June, usually in small flocks. One seen near Teller.

Clangula clangula americana. GOLDEN-EYE.

Clangula islandica. BARROW'S GOLDEN-EYE.—Both Goldeneyes were seen in southeast Alaska.

Charitonetta albeola. BUFFLE-HEAD.—Abundant in Stag Bay—Chichagof Island, southeast Alaska, May 6 and 7.

Harelda hyemalis. OLD SQUAW.—Thousands were seen near Juneau, May 5. Occasional birds were seen in the Arctic Ocean and near Bering Strait. Probably this species, but identification was unsatisfactory.

Histrionicus histrionicus pacificus. PACIFIC HARLEQUIN DUCK.—Seen in southeast Alaska, May 9, near Unimak Island, May 18, and present in pairs on King Salmon Creek near Port Moller in June. Also small flocks of male birds along shore and at Kashega Bay, Unalaska Island.

A pair usually swam down stream very close together. Near Port Moller I saw a male obviously looking for its mate, and have no doubt but that they breed there.

Polysticta stelleri. STELLER'S EIDER.—One male was seen near the Diomedes, July 27. Thirty in the brown plumage, were near the Big Diomede, September 3. At least two others were seen at Bering Strait. It is difficult to distinguish this bird in its autumn plumage from the Spectacled Eider.

Arctonetta fischeri. SPECTACLED EIDER.—Several were seen about Bering Strait. Both this and the preceding species display considerable curiosity.

Somateria v- nigra. PACIFIC EIDER.

Somateria spectabilis. KING EIDER.—The identification of Eiders was unsatisfactory throughout the trip. They were first seen at Unimak Island, May 18. Several hundred were at Moller Bay, May 22 to 24. Few showed any white in the plumage, and probably none were in the adult male plumage. One collected proved to be a young male in imperfect plumage. Near Teller, Eiders were present and young were seen, but identification was not good. Five King Eiders were seen July 7 near Cape Prince of Wales. On August 1 several distant flocks of male Eiders were flying south at a point 68° 30′ north latitude, about due north of East Cape.

Oidemia americana. AMERICAN SCOTER.—Seen only about Moller Bay and on fresh water pools on the tundra, May 23 to June 20—not common.

Oidemia perspicillata. SURF SCOTER.—Though outnumbered by *deglandi*, this bird was abundant at Wrangell Narrows May 3, and outnumbered *deglandi* near Juneau, May 4, where it was very numerous.

Oidemia deglandi. WHITE-WINGED SCOTER.—Abundant in southeast Alaska, May 1 to 9. Seen near Unimak Island, May 18. A few about Moller Bay, May 22 to June 2.

The greatest numbers of both this and the preceding species were seen about villages or buildings, docks, etc., along shore.

Several distant unidentified flocks of ducks were seen October 5, at a point about 300 miles west of Prince Rupert, flying southwest.

Branta canadensis occidentalis. WHITE-CHEEKED GOOSE.

Branta canadensis minima. CACKLING GOOSE.—Geese, probably the White-cheeked, were present in southeast Alaska in early May. On May 9, Geese were seen flying northwest, several miles off shore in the Gulf of Alaska. Three flocks of what were probably Cackling Geese were migrating to the southwest May 16, inside the Shumagin Islands.

Branta nigricans. BLACK BRANT.—One flock, probably migrating, southeast Alaska, May 5.

Philacta canagica. EMPEROR GOOSE.—Two were seen off St. Lawrence Island, July 8. One was secured at Teller, September, 8 from natives. Five, flying southwest, were seen off Akun Island, Aleutians, September 27. This Goose was said to have been abundant at Nelson Lagoon, just southwest of Port Moller, before our arrival May 22. None were seen at Port Moller.

Olor columbianus. WHISTLING SWAN.—Eight Swans were seen in groups of from one to three, flying over the tundra, May 24 to June 14, near Port Moller.

Grus canadensis. LITTLE BROWN CRANE.—Seen on the delta of the Agiapuk River, near Teller, in July. On August 27 one flock, and on August 30, two flocks, about sixty birds in all, were flying from East Cape across Bering Strait. A flock was seen flying September 10, near Teller.

Phalaropus fulicarius. RED PHALAROPE.—First seen near the Shumagin Islands, May 15 and 16, at Moller Bay, and throughout Bering Sea on the northward voyage.

They were abundant north of Bering Strait, July 30, and throughout the portion of the Arctic Ocean which we visited, particularly near the ice. My notes record them as very abundant up to and including September 1, present on September 2, and not numerous thereafter. A few were seen until September 21, in south Bering Sea, but any of these later birds might have been *lobatus*.

The molt was in progress early in August, and soon no red-breasted birds were seen. Only one bird (at Port Moller) was seen on or near the shore.

Lobipes lobatus. NORTHERN PHALAROPE.—Present in southeast Alaska early in May. Abundant about the Port Moller region in all sorts of pools on the tundra after June 1 until our departure on June 22. Present but not abundant in the Teller region. Last seen in Dutch Harbor, Unalaska Island, September 26. Though it is difficult to distinguish the two species in the autumn plumage at sea, there is good reason to believe that all the birds seen in the Arctic Ocean were *fulicarius*.

Gallinago delicata. WILSON'S SNIPE.—Present about the Port Moller region in early June. A breeding pair seen near Teller, July 11.

Macrorhamphus griseus scolopaceus. LONG-BILLED DOWITCHER. Several were seen and one collected near Port Moller, June 12.

Arquatella maritima couesi. ALEUTIAN SANDPIPER.—A nest was found near Moller Bay, May 30, at an altitude of perhaps 1500 feet. Three eggs were in the nest and one in a depression about six inches away, the surroundings indicating that it was probably deposited in the wrong location. One was collected at Moller Bay, June 4. They were abundant at Kashega Bay, Unalaska Island, June 29, usually, but not always at high altitudes. Their behavior indicated that the young were hatched at this time, but I found none.

Pelidna alpina sakhalina. RED-BACKED SANDPIPER.—Several were seen about the Port Moller region in June.

Ereunetes mauri. WESTERN SANDPIPER.—Numerous about willow thickets along small streams in the tundra near Teller, July 11.

Pisobia minutilla. LEAST SANDPIPER.—Abundant about Port Moller after May 25. Found everywhere near the tundra pools, together with the Northern Phalarope.

Limosa lapponica baueri. PACIFIC GODWIT.—Godwits were numerous on a hill near Teller, July 11. They were belligerant and noisy. Though I could find no young they were undoubtedly breeding. We found them abundant, probably in family groups, on the delta of the Agiapuk River, July 21. Birds collected proved to be the Pacific Godwit.

Numenius tahitiensis. BRISTLE-THIGHED CURLEW.—On a wide rounded hill between Grantley Harbor and Imuruk Basin east of Teller, which has, according to the chart, an elevation of 625 feet, were found numerous Curlew together with an equal or greater number of Godwits. This hill was covered with tundra moss and grass, much like the rest of the locality. These birds were very noisy and belligerant, flying directly at me from a great distance until very close. Unfortunately I found no nest or young. One bird collected proved to be the Bristle-thighed Curlew.

Mr. A. C. Bent, in the 'Life Histories of North American Shorebirds' says the breeding range of this bird is unknown. The actions of these birds would indicate that they were breeding here. The absence of water where the birds were found, even of small streams, was due to the low rounded shape of the hill, which was about two miles from Imuruk Basin and the salt-water channel which connects that basin with Grantley Harbor. Grantley Harbor is connected in turn with Port Clarence and Bering Sea. Therefore this hill, though only two miles from salt water, is in effect a considerable distance from Bering Sea proper, and I suspect that the bird nests in loose groups away from the immediate vicinity of the water, and that due to this it has escaped the notice of ornithologists.

A Curlew was seen on the low marshes near Imuruk Basin, July 21.

Aegialitis semipalmata. SEMIPALMATED PLOVER.—One was collected and others seen near Port Moller, June 14, 15, and 21.

Charadrius dominicus fulvus. PACIFIC GOLDEN PLOVER.—Breeding abundantly on the tundra near Teller July 11.

Arenaria intrepres morinella. RUDDY TURNSTONE.—Two were collected on Imuruk Basin in mid-July.

Haematopus bachmani. BLACK OYSTER-CATCHER.—Seen near Unimak Island, May 17 and at Kashega Bay, Unalaska Island, June 29.

American Museum of Natural History,
New York City.

ON THE BODY TEMPERATURES OF NESTLING ALTRICIAL BIRDS.

LEON L. GARDNER.

THE study of body temperatures of birds, with the exception of the comprehensive investigation of Wetmore,[1] has only been sparingly considered by ornithologists. Bergtold[2] has studied the influence of body temperature on the incubation periods of birds and finds that the length of incubation is determined by the temperature of the incubating parent. Simpson and Galbraith[3] secured records of the body temperatures of a limited number of birds at three hour intervals for a week which demonstrated the existence of a diurnal rhythm. Other references are found scattered in the literature, largely in journals and books of physiology. Records of temperatures of nestling birds, however, are conspicuous by their absence in most of these sources.

Many of the observations on birds have been secured from freshly killed specimens. The major portion of Wetmore's results were obtained in this manner. This gives reliable results but is only a cross section of the thermic life of the bird and gives only a limited conception of the fluctuations that take place in it as a living reacting organism. An excellent opportunity is presented, in the case of nestling birds, however, for securing a continuous series of observations. As a result a composite picture can be made of the alternations undergone by the body temperatures in young birds and of the factors that influence them.

The present paper is based on over 450 observations of body temperatures. These are scattered among twenty-four species of nestling altricial birds in all stages of development.

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[1] Wetmore, Alexander. A Study of the Body Temperature of Birds. Smithsonian Miscellaneous Collections, Vol. 72, No. 12, Washington, Dec. 1921, pp. 1–52.

[2] Bergtold, W. H. A Study of the Incubation Periods of Birds. Denver, 1917, pp. 1–109.

[3] Simpson, S., and Galbraith, J. J. An Investigation into the Diurnal Variation of the Body Temperature of Nocturnal and Other Birds, and a few Mammals. Journ. of Phys., Vol. XXXIII, 1905, pp. 225–238.

METHOD OF OBTAINING TEMPERATURES.

All temperatures are rectal. A small bulb clinical thermometer, lubricated with petrolatum, was used and inserted gently well into the bowel and maintained there until the mercury ceased to rise. This can be done with little fear of injury even in recently hatched birds. The young bird frequently defecates at this time and relaxes the bowel for the necessary manipulation. Temperatures should be taken at once in the nest since removing the young for even short periods of time causes a marked fall of temperature. This is well illustrated in the case of two young Mourning Doves (*Zenaidura macroura carolinensis*) about eight and nine days old that were taken from the nest at 7:40 P.M. July 20, 1926 and temperature readings recorded every five minutes thereafter for thirty-five minutes. There was a gradual and continuous fall throughout this period. The larger bird gave an initial reading of 106.0 followed at five minute intervals by 104.7, 103.5, 103.2, 102.7, 101.2, and 101.0. The smaller registered, in the same length of time, 105.1, 104.2, 104.1, 103.7, 103.1, 102.4, and 102.9. The temperature of the surrounding air remained practically constant at 97 during this time.

All birds were banded at the first observation, or if too small, were marked for identification and banded when larger. In this manner the exact identity of each individual was known and the fluctuations in its temperature followed with accuracy.

FACTORS THAT INFLUENCE BODY TEMPERATURES.

Age. In altricial young this is a very important factor which can readily be substantiated by abundant observations. Other things being equal the younger the bird the lower will be its temperature. With advancing age the temperature rises, becomes more constant and less subject to violent fluctuations in response to external influences. Part of this no doubt is due to the development of contour feathers but some at least must be attributed to a stabilization of the thermogenic mechanism.

A number of examples among the recorded cases are of interest and instructive in this regard. The temperatures of one hundred and five nestling Doves were studied. One hundred and one of these nestlings were banded. Since young Doves offer practically

no resistance to handling, temperature changes caused by struggling can be eliminated. The influence of age is thus more readily ascertained in this species. The general statement is true, practically without exception in this series, as reference to appended tables shows, that under uniform conditions younger birds show lower temperatures than do more fully developed fledglings.

July 5 at 5:30 P.M. a two day old Dove (*Zenaidura macroura carolinensis* No. 437960) registered 103.2 while its three day old nest mate (No. 437961) was 103.9. On July 10 at 4:00 P.M. the first bird had increased to 104.9 and the latter 106.1. This accession in temperature occurred in spite of the fact that this day and hour was twelve degrees cooler than the earlier date. On July 14 at 5:30 P.M. the temperature of the first bird had again increased and was now 107.4 although this day was twenty two degrees cooler than July 5.

A nestling Dove (No. 437972) four days old on July 16 at 8:00 P.M. registered 102.1 (85°). Temperatures in brackets indicate the state of the surrounding air. July 20 at 7:40 P.M. it was 105.1 (98°). July 22 when about ten days old it was 106.8 (82°) at 8:00 P.M. On July 24 at 7:30 P.M. after if had left the nest it registered 107.9 (92°).

A five day old Dove (No. 437973) on July 16 at 8:00 P.M. registered 103.2 (85°). July 20 at 8:00 P.M. it had increased to 105.9 (97°), July 22 at 8:00 P.M. it was 106.1 (82°) and on July 24, 7:30 P.M. when able to fly it was 107.8 (92°).

Two Doves (Nos. 441928 and 441929) when about five and four days old respectively on July 20 at 7:30 P.M. (98°) registered 104.6, 104.5. July 22 at 7:30 P.M. (83°) they were 105.3 and 104.8. July 24 at 1:30 P.M. (89°) they had increased to 106.7 and 106.4 although in the evening of that date the younger one had made an unexpected recession to 103.7. July 26 at 8:00 P.M. a still further increase was recorded at 107.2 and 106.9 while the outside air was 87°. On July 27 at 7:30 P.M. (91°) the highest reading of all was attained at 107.6 and 109.1. The latter bird struggled a little which no doubt accounts for the unusually high temperature.

A Dove five days old (352399) and its nest mate four days old (No. 352400) registered 103.0 and 100.7 respectively on August 4 at 6:30 A.M. (66°). The next day at 6:30 A.M. (71°) they were

104.4 and 103.5. The day following this at 7:00 A.M. (77°) there was an unaccountable drop in the temperatures which were 103.6 and 103.3 respectively. On August 8 at 7:00 A.M. (66°) they registered 105.4 and 105.2. On August 10 at 6:30 A.M. (83°) the temperatures had risen still further and were 105.5 and 106.5 respectively. Note that these are all morning records.

A Dove three days old (No. 352403) registered 98.6 and its nest mate two days old (No. 352404) 93.9 on August 4 at 6:30 A.M. (66°). At 8:00 P.M. the same date (95°) they were 103.3 and 101.7. August 5 at 8:00 P.M. (100°) they were 103.4 and 104.5. August 7 at 8:00 P.M. they were 103.6 and 102.5 while the surrounding air was 84. August 8 at 8:00 P.M. (101°) they were 104.4 and 105.8. August 9 at 3:00 P.M. (100°+) they were 107.2 and 107.1. On the afternoon of the next day a sudden cool shower soaked the young and this was reflected by a sudden drop in the body temperatures to 103.0 and 100.7. Records on these two nestlings were made three times a day for a week and an interesting and instructive chart of the alternations undergone in the body temperatures was obtained.

A young Turkey Buzzard (*Cathartes aura septentrionalis*) early in its development attained the temperature normal to the species; the range covered was not great being a rise of only slightly over two degrees. Thus when five days old it registered 101.2. At one week of age it was 102.5 and at two weeks of age it had risen to and above the normal for the species. Thereafter there was a remarkable constancy of temperature at about 103.6 except when influenced by other factors shortly to be mentioned. The Buzzard therefore apparently stabilizes its temperature long before the appearance of feathers and while the general development of the body is still very immature.

Two young Great Horned Owls (*Bubo virginianus virginianus*) were studied during their stay in the nest. There was a gradual rise in the body temperatures during this entire time. This was true regardless of the time of day at which the observations were made or the state of the surrounding atmosphere, as reference to appended tables demonstrate. On April 19 when sixteen days old the smaller Owl had a temperature of 102.2. When twenty-three days old it was 103.8. This rose to 104.0 at the age of thirty-two

days; 104.2 at thirty-six days of age and two days after leaving the nest was 105.0 when the young Owl was about forty-four days old. On April 20 the larger Owl when twenty-one days of age registered 102.6. This was 103.8 at twenty-seven days of age and 104.8 when thirty-six days old. Thereafter, although it was ten days longer in the nest, no records could be obtained on this youngster as it invariably gravely and sedately vacated the nest on my approach and walked far out of reach on the smaller limbs. These temperatures are somewhat higher than the mean given by Wetmore for this species. They, however, represent resting temperatures in every instance except in the case of the smaller Owl when out of the nest (105.0) when a slight degree of resistance was made to the examination.

Flickers (*Colaptes auratus luteus*) seem to form a rather curious exception among the birds that I have studied. A number of naked young were followed for nearly two weeks as feathers developed. There was no indication of a rise in temperature during this time. The first temperatures recorded were as high as any subsequently found and the final observation at the time of leaving the nest showed a body temperature in these birds far below that normal to the species as reported by Wetmore.[1] It is not known when the final temperature is attained. Very small Flickers were not found but an observation on a young Red-bellied Woodpecker seems to show that the temperature is very low at first and is then rather quickly stabilized at a higher level but one which is, nevertheless, considerably below the mean for the species. When a few days old, naked and quite small, the Red-bellied Woodpecker (*Centurus carolinus*) registered 98.4. Five days later when it had developed in size it had increased to 102.8. The significance of these findings in the case of Woodpeckers is not known. It is an interesting speculation as to whether or not there is any correlation between these observations and the rearing of the young in protected nests such as in hollow trees.

Kingbirds furnish another example of increasing body temperatures coincident with advancing development. On June 30 at 6:30 A.M. four young Kingbirds (*Tyrannus tyrannus*) were found. They were about five days old and were almost naked save for a few tufts of white down. They registered 102.9, 103.6, 102.5, and

the smallest was 101.5. On July 5 at 8:30 A.M. when contour feathers had begun to develop they showed an increase to 106.6, 107.5, 106.7, and the smallest 104.5. The temperature of the two days was practically identical at these hours. On July 10 all had left the nest except the smallest which registered 105.5.

Phoebes (*Sayornis phoebe*) also show an increasing body temperature with advancing age. On June 23 at 3:00 P.M. five fledglings, four to six days old were examined. Their temperatures were 102.2 100.1, 101.4, 96.8, and 102.7. The lowest reading was found in the smallest bird of the lot which appeared considerably younger than the others of the family and which was visibly chilled when removed from the nest. Two days later, noon June 25, these youngsters registered 105.4, 105.5, 104.4, 103.1, and 106.4 respectively. Contour feathers were just beginning to develop on this date. The temperature of the day was practically the same as on the former date.

The temperature of very young birds is apparently remarkably low. Thus two freshly hatched Blue Jays (*Cyanocitta cristata*) gave readings of only 95.8 and 96.0 on June 29 at 8:00 P.M. in spite of the fact that the surrounding air registered slightly over 100 at this hour. On the appearance of feathers much higher temperatures are found. As an instance a nestful of young Blue Jays that were out in contour feathers and nearly ready to leave the nest June 19 at 4:30 P.M. (67°) registered 105.0, 106.0, 105.8, and 106.0. These readings while high are still two to three degrees lower than the temperature of adult Jays.

A young Catbird (*Dumetella carolinensis*) when six days old, June 16 1:00 P.M. had a temperature of 101.8. This was before the development of contour feathers. A week later, June 23 3:30 P.M. it had left the nest and was found hiding in adjacent lilac bushes. An observation made at this time showed an increase of temperature to 105.0. This was not due to atmospheric conditions as this day was one degree cooler than the former day and hour.

A number of Brown Thrashers (*Toxostoma rufum*) were observed at various stages of development. Those that were naked and small gave low readings while those nearly ready to leave the nest had high temperatures, as high as 108.8 which is probably very nearly the normal for the species. Subsequent readings were made

on four young Thrashers that demonstrated a definite rise in the individual case. Thus on July 8 at 5:30 P.M. four Thrashers about six days old and in pin feathers registered 104.5, 104.2, 104.1, and the smallest 103.1. Four days later (July 12 7:30 P.M.) when contour feathers had begun to develop there was an increase in the temperature to 105.2, 105.4, 105.5, and 103.5 respectively. This rise took place in spite of the fact that the surrounding air was nine degrees cooler on this date than on the former.

Young naked Robins (*Planesticus migratorius*) have relatively low body temperatures. A rapid rise occurs during the period in the nest and at the time of the initial flight temperatures approximating the normal for the species are found. In several instances very high temperatures were found in well developed fledglings, in one case being over 110 which is somewhat above the mean for the adults. A follow up reading in one young Robin readily demonstrated this rise. When two days old, July 5 at 5:30 P.M. (96°), it registered 104.3 which is, however, a relatively high temperature for so young a bird. When eleven days old, July 14 at 5:30 P.M. (89°) the temperature had increased to 106.1.

One family of Bluebirds (*Sialia sialis*) was studied. The evidence in this case is definite but the results are influenced by other factors that complicate the findings. Three young Bluebirds when about five days old and still without feathers registered 98.3, 95.8, and 94.6, June 25 at 6:30 A.M. (61°). On June 29 at 5:30 P.M. (100°) when feathers were developing they were 106.9, 106.2, and 107.1. July 2 7:00 A.M. (78°) they registered 103.6, 103.8, and 103.2. They were now well feathered and nearly ready to fly. It is to be noted in this case that high temperatures of the nestlings are coincident with high atmospheric readings which makes the evidence less satisfactory in the demonstration of the influence of age alone on body temperatures. The only incubating parent among all of the nests studied was caught and observed in this instance, The nest was in a hollow pipe and on discovery of the site the female was taken out of the pipe and her temperature taken to which examination she submitted without fear or protest. A reading of 109.2 was obtained. It is of interest to note that this temperature is one degree higher than the maximum for the species reported by Wetmore.[1]

It is obvious from the instances cited that body temperature increases with increasing development of nestling birds. A comparison with the mean temperature normal to the species, however, shows that the temperature at the time of leaving the nest, in most cases, is considerably below that of adult birds. It is a question when the normal adult temperature is attained.

Temperature of surrounding air.[1] Thermotaxis or the thermoregulatory function in young birds is apparently poorly developed. Profound alterations in body temperature are caused by changes in the temperature of the surrounding air. It is this factor that makes it necessary for the parent to continue incubation of the young on cool days and to stand as a shield from the sun, especially in the case of exposed nests, on very hot days. External heat, it is well known,[2] may be a cause of fever in human infants also, but to a much milder degree. Rapid changes in body temperature that would be fatal to man are experienced daily by young birds with perfect equanimity. In any study of body heat of young altricial birds the state of atmospheric temperature must be considered. The factor of age is manifested by a rising mean temperature but superimposed on this is the profound influence of external heat or cold so that violent undulations are brought about.

There is a diurnal rhythm manifest in young birds the peak of which is roughly coincident with the hours of greatest intensity of sunlight. This tends to subside somewhat more rapidly than the atmospheric air cools. Evening temperatures are usually lower than those of early afternoon although in many instances the thermographic reading shows little or no decline in the temperature of the surrounding air. As a corollary of this it is probably true that there is a mild seasonal variation so that the body temperatures of nestlings hatched in the hotter months of midsummer average higher than do those of earlier or later hatchings.

A few cases are rather instructive in this regard. Three Mourning Doves (*Zenaidura macroura carolinensis*) were rather intensively studied in the nest, temperatures being recorded three times a

[1] Acknowledgements are due Professor E. C. Converse, Kansas State Agricultural College, Manhattan, Kansas, for use of thermographic records of hourly temperatures throughout the period of this investigation.

[2] Talbot, F. B. Body Temperature and Its Regulations, in Abt's Pediatrics 6: 8, 1925.

day. One of these was freshly hatched when found on August 4. Unfortunately the mother failed to return after six visits and death resulted. A pair, two and three days old respectively, were located in a neighboring nest at the same time. These were followed for eight days or until August 11 at which time the writer left for a protracted absence. Interesting results were obtained which may be briefly summarized as follows. In every instance the early morning temperature was low. The peak occurred in midafternoon and the evening temperature was intermediate. On August 10 a cool shower fell about four in the afternoon and this was reflected by a marked fall in the temperatures of the young. The mean temperature gradually rose with increasing age and development. Throughout this investigation it was feared that the mother would weary of the repeated intrusions and leave the young to perish. But with a heroic devotion that could not but inspire profound admiration she returned doggedly to her duty.

Two Doves about three and two days old on September 19 at 2:00 P.M. registered 103.0 and 102.3 respectively. By evening there was a cooling of the body heat and at 6:30 P.M. their temperatures were only 99.6 and 100.9 respectively.

Flickers (*Colaptes auratus luteus*) give another example of this diurnal rhythm. On June 29 at 3:00 P.M. three naked young about nine days old registered 106.8, 106.8, and 105.9. In the evening at 8:00 P.M. although the air had not as yet cooled off they recorded 102.9 (smallest), 104.5, and 104.1 respectively.

The effect of external temperature is evidenced in another manner by a young naked Arkansas Kingbird (*Tyrannus verticalis*) about one week old. This bird and its mates had to be taken to the ground from a nest far out on a precariously slender limb. It became chilled in so doing as it was a rather cool morning (56 degrees, June 26 7:00 A.M.) and the thermometer which could not register lower than 94.0 was unable to record any reading. When this nestling was warmed by simply holding in the hand it reacted promptly to 97.1.

On June 11 at 1:00 P.M. a nest of young Lark Sparrows (*Chondestes grammacus*) was found on a bare exposed hillside. The mother stood over the nest with outstretched wings. The nestlings were in pin feathers and registered 105.6, 105.2, and 106.8.

Two days later when the sun had set at 7:30 P.M. the first bird registered 103.4 and the last was 103.2. No reading was made on the other as the young were becoming frightened and trying to leave the nest.

Young Brown Thrashers (*Toxostoma rufum*) furnish another instance in which the body temperature is highest during the hours of maximum intensity of sun light. Four young Thrashers (Nos. 437015–18 inclusive) were observed for several days. At 1:00 P.M. June 29, a very hot day, when about nine days old, they had the unusually high readings of 108.3, 107.5, 108.6, and the smallest 106.5. At 7:30 P.M. the same date, after the intensity of sunlight had diminished, they were 105.0, 104.8, 103.5 and the smallest 102.0 respectively. There was thus a drop of from three to five degrees in the short space of an afternoon.

Another nest of young Thrashers (Nos. 437956–59 inclusive) was observed at a later date. On July 10 at 3:00 P.M. when about eight days old and of nearly the same degree of development as the set reported above they registered 105.3, 105.2, 105.2, and the smallest 104.9. At 8:00 P.M. the same date they were 104.1, 103.7, 104.6, and the smallest 104.1 respectively. This was a cooler day than in the former case. There was, therefore, not as high a mid-day reading as in that instance and as a consequence the fluctuation is less. The evening temperatures in the two sets correspond fairly well.

A diurnal rhythm is manifested in young birds, therefore, the peak of which is roughly coincident with the hours of maximum intensity of sunlight and heat. This may cause a rise in body temperature from very low degrees in the early morning to unusually high points on very hot days and causes violent fluctuations in the thermal state of the body that is borne with surprising equanimity.

Exertion. Another factor that influences body temperatures in young birds is that of exertion. Violent struggling on the part of some (if not all) nestlings and young birds causes a marked and abrupt rise in temperature. Whether normal efforts put out in flight will do the same is not known nor is it possible to state at this time what influence fear plays in the findings given herein.

A young Turkey Vulture (*Cathartes aura septentrionalis*), already cited, was investigated from the time of hatching to the day of its

abandonment of the home cave. A reading was obtained in each instance in the cave after which it was taken out and photographed in the sunlight. It invariably struggled at these times which inevitably caused a rise in temperature of at least three degrees. This rise could be induced at will by causing the young Buzzard to fight or struggle. It was very pugnacious and teasing with a stick provoked it to a vicious attack at which times it clung to the stick with singular tenacity. After such an affray an investigation of its temperature showed that a prompt rise had occurred. Evidences of distress were manifested by quick panting respiration with the beak open, the glottis dilated widely and brought well forward to the front of the mouth the more readily to obtain cool air. This bird, it will be recalled attained its adult temperature at the age of two weeks and while still very immature in its development. It also underwent a mild diurnal rhythm as was evidenced by a night temperature when it was asleep in the cave. At this time there was a drop of one degree below the normal.

Well developed fledglings that have left the nest and are capable of caring for themselves are still subject to this influence. Two young but fully grown Red-tailed Hawks (*Buteo borealis*) were kept in an aviary and observed for a month. Their diurnal temperatures ranged from 106.6 to 108.0. These were resting temperatures and it is to be noted are not in accord with the findings of Wetmore[1] as the mean for the species. At 10:00 P.M. June 29 a night reading was made. The bird with 108.0 was now 104.8 and submitted sleepily to the examination. The other which had recorded 106.6 was much alarmed by the light and unaccustomed disturbance. It fought viciously, flopping onto its back and striking painful blows with the talons. It was subdued with difficulty after the temperature was found to be at the unprecedented figure of 109.2. Later, on July 1, both of these birds were released in the canyon of their home. In transportation they struggled violently and at the time of their release showed every evidence of extreme distress to judge from the state of their body temperature. They registered 109.2 and 109.3.

A young Great Horned Owl (*Bubo v. virginianus*) was kept in captivity for one month. The average daily temperature was found to be 104.8. When about twelve weeks old it was taken to

the site of capture and there released. It struggled violently during transportation and arrived in a state of distress from the exertion and heat of the body. The beak was partially open, the glottis dilated and far forward in the mouth, the respirations were labored and fast while saliva dripped from the mouth. The body temperature was found to be 108.2.

Handling alone may cause a drop in body temperature. This has already been illustrated in the case of the two young Mourning Doves (*Zenaidura macroura carolinensis*) referred to in the introduction. Other instances may be cited. Two Doves about five days old June 29 registered 104.5 and 103.6. Five minutes later they had dropped to 101.8 and 101.1. On June 30 a five day old Dove registered 104.2. In five minutes this had dropped to 101.8.

Two Yellow-billed Cuckoos (*Coccyzus a. americanus*) six and five days old were removed from the nest July 16 and observations made at once gave 105.4 and 104.3. After five minutes rest in the warm grass exposed to the sun they registered 103.8 and 104.5 respectively. In two minutes more the first had risen slightly to 104.6. In another minute the first was down again to 103.9 and the second was holding approximately at a level at 104.1. There was no struggling on the part of these two. Outside the gentle handling and removal from the nest no disturbing factors existed. This furnishes an instructive example of the fluctuations in body temperature undergone by nestlings. It is manifest also in the face of such volatile changes that too much reliance can not be placed on single observations unless uniform conditions prevail.

A final instance is found in the case of a young Brown Thrasher (*Toxostoma rufum*) which on June 28 when eight days old registered 105.1. Ten minutes later it was removed from the nest and again examined at which time there was a drop of exactly two degrees.

Feeding or the introduction of cold food may cause a transitory drop in body heat, as is evidenced by the following cases. Readings were made on three young Blue Jays (*Cyanocitta c. cristata*) June 23 at 9:00 A.M. They registered 103.6, 104.3 and 102.4. They were then fed chopped cold beef and another reading made. There was an abrupt and immediate drop in all as follows: 100.1, 103.0, and 100.2. After exposure to the warm sun they were up to 104.0, 105.9, and 102.9 respectively.

Absence of the incubating parent if prolonged must cause a drop in body temperature of the young. For short times they no doubt maintain practically normal conditions by nestling close together under the protection of the nest. How long the adult may stay away without danger to the young and what influence this factor has on the movements of the adult is not known. There is opportunity here for interesting investigation.

Fatigue, hunger and *illness* cause a considerable lowering of body temperature. From time to time well feathered young were picked up from the ground that were drowsy and apathetic and obviously ill. These always gave readings far below the normal for that stage of development. These birds were not banded nor included in the tables since they did not throw any light on the normal findings.

Camp John Hay,
Philippine Islands.

BIRDS AS A FACTOR IN THE CONTROL OF A STOMACH WORM OF SWINE.[1]

BY ELOISE B. CRAM.

Introduction.

A GROUP of roundworm parasites known as spirurids, the name being derived from the superfamily name Spiruroidea, occur as adults in a wide variety of hosts, including mammals, reptiles and birds. These parasites have an indirect life history, that is one in which there is involved an intermediate host. This intermediate host is usually a small arthropod, such as an entomostracan or insect; encysted in the body tissues of the arthropod, the larval form of the parasite develops to a stage which is infective for the final host. Birds which feed on arthropods in large numbers, such as water birds which eat entomostracans and insectivorous birds which eat insects, are therefore liable to infection with such parasites and it is not surprising that a great variety of adult roundworms of this group is found to occur in such birds.

However, the arthropods which are eaten by birds may be infested with roundworm larvae which as adults parasitize a group of animals other than birds, such as mammals. The fate of such larval parasites which are thus introduced into the wrong host has been studied by earlier workers, notably the French parasitologist Seurat, who found that the larvae migrate into the tissues of such a host and again encyst.

The present investigation resulted from the discovery made by H. L. Stoddard several years ago that the Loggerhead Shrikes (*Lanius ludovicianus ludovicianus*) in northern Florida, chiefly in Leon County, and in southern Georgia, chiefly in Grady County, were infested with large numbers of roundworms encysted in the walls of the digestive tract. These parasites were identified by the writer as spirurid larvae and the infestation as a case of aberrant parasitism such as that mentioned above, the larvae being in a

[1] Read before the Forty-seventh Stated Meeting of the American Ornithologists' Union at Philadelphia, Pa., October 24, 1929

host other than the correct final host and therefore incapable of further development. As the larval forms of these parasites have been little studied, identification was thought impossible from morphological examination, but an opportunity was later presented for a more extensive investigation of the life history of the parasite by means of feeding experiments.

Findings of present investigation.—During a two months period, May and June, 1928, twenty-one Loggerhead Shrikes from Leon County, Florida, were examined by the writer and each bird was found to be infested with large numbers of the encysted larval parasites. The roundworms were located in the walls of the digestive tract, near its outer surface, and also in the mesenteries. All parts of the digestive tract were found to be parasitized, from the upper end of the esophagus, near the mouth, to the lower end of the intestine. As regards the stomach, the wall of the proventriculus was more heavily infested that that of the gizzard. However, the concentration of the infestation was observed to be always at the posterior end of the digestive tract, in the rectum and its mesenteries; here the larger number of larvae and the thinner walls of the tract greatly facilitated the finding of the parasites. There was no visible evidence of damage to the wall of the digestive tract from these massive invasions of small roundworms; due to the fact that one hundred per cent of the Shrikes of that vicinity appeared to be infested, judging from a considerable number of examinations made by H. L. Stoddard during a period of five years, and from the twenty-one examinations made by the present writer, no comparison was possible of an infested with a non-infested bird, to judge of clinical or pathological results of the parasitism.

Desiring, as a first step in the unravelling of the life history of this parasite, to discover the arthropod intermediate host which was responsible for the infection of the Shrikes, the writer was struck by the fact that the stomach contents of the birds in a large percentage of cases showed the brightly colored parts of the dung beetle, *Phanaeus carnifex*, and attention was accordingly directed toward this beetle as a possibility. Examination of specimens of *P. carnifex* in the same vicinity revealed the fact that practically one hundred per cent were heavily parasitized with the same larval roundworm as was found in the Shrikes. A second dung beetle,

Canthon laevis, was also found to be infested, although to a lesser degree.

Examination of birds other than the Shrike, which would probably feed on these beetles, resulted in the finding of similar natural infestations of the larval roundworm in three Screech Owls (*Otus asio asio*) and one Red-tailed Hawk (*Buteo borealis borealis*) taken in Grady County, Georgia.

In an attempt to determine the final host of the parasite, feeding experiments were undertaken; larvae derived from Shrikes and also those from the arthropod hosts, were fed to a series of experiment animals, representing birds, mammals and reptiles, with the following results:

Reëncystment of larvae derived from the Shrike was experimentally produced in the digestive tracts of one Turkey, two Chickens, two Red-tailed Hawks, one skunk, one oppossum, two rats, three mice and one black snake.

Reëncystment of larvae derived from the dung beetle (*Phanaeus carnifex*), was experimentally produced in the digestive tracts of one Screech Owl, three Turkeys, three Bobwhites, three Chickens, one Pigeon, one skunk, one opossum, one mouse, two rats, one rabbit and one guinea pig.

In these experiments check animals held as controls in each case were negative with reference to infestation with the parasite except in the cases of the Owls, Hawks, rats, and snake, in which the check animals were also parasitized. It is possible, therefore, that the findings in these animals, after experimental feeding, represented an experimental infestation superimposed on a natural infestation.

The reëncystment of the spirurid larvae in each of these experiment animals indicated that the final host of the parasite was not included in the series. As the result of an observation made during the collection of the dung beetles, namely that in pastures in which there was a choice of manure from cattle, horses and swine, the beetles showed a decided preference for that from swine, it was concluded that swine were probably the final host of the parasite. Accordingly three young pigs were fed respectively as follows with the results as shown:

Six specimens of the beetle (*Phanaeus carnifex*), with the finding at necropsy two months later of approximately 1700 specimens of

the roundworm (*Physocephalus sexalatus*), in the stomach of the pig.

About one-half the length of the intestinal wall of a Loggerhead Shrike, with the finding at necropsy 80 days later of approximately 800 specimens of the roundworm (*Physocephalus sexalatus*), in the stomach of the pig.

Six specimens of the beetle (*Canthon laevis*), with the finding at necropsy 5½ months later of 12 specimens of *Physocephalus sexalatus* in the stomach of the pig.

This feeding experiment, in contrast to the former series which was carried out at Beachton, Georgia, was conducted at the experiment station at Beltsville, Maryland, the beetles and Shrike viscera having been brought from Florida; the pigs were raised on concrete floors and two of the lot of five pigs were held as check animals, these showing at necropsy an absence of the stomach worms which were present in the experimentally fed pigs.

Discussion.—The identity of the larval roundworms found in cases of aberrant parasitism encysted in the walls of the digestive tracts of Loggerhead Shrikes, Screech Owls and Red-tailed Hawks in southern Georgia and northern Florida was thus established experimentally as *Physocephalus sexalatus*, which in its adult form is a stomach worm of swine. The arthropod intermediate hosts of the roundworm, from which the birds derive the infestation, were found to be the dung beetles, *Phanaeus carnifex* and *Canthon laevis*. It was experimentally established that the parasite would also encyst in Chickens, Turkeys, Bobwhites and Pigeons, as well as in certain mammals and reptiles. However, due to the food habits of the Shrike, that is, habits involving a large consumption of these beetles, and the abundance of these birds in the area involved, the Shrike is probably the most important of the accidental hosts of this parasite in that locality.

The practical significance of these findings is easily seen. Swine being raised in such an area are protected from infection with this roundworm to the extent to which the arthropod intermediate hosts are consumed by birds and other animals which serve as accidental hosts. It was shown that six specimens of the dung beetle (*Phanaeus carnifex*) were capable of infecting a pig with approximately 1700 specimens of this stomach worm. The numbers of these parasites

which are prevented from completing their normal life cycle, because of the ingestion of the beetles by Shrikes and other birds of similar food habits, is therefore evidently enormous, and birds in this manner undoubtedly are an important factor in limiting the degree of infestation of swine with this parasite. A definite correlation may be suspected between these two factors and it is probable that a decrease in such birds would result in an increase in this stomach worm of swine, in a given area such as that considered. While swine would become infested by eating these accidental secondary hosts, and doubtless do in some cases, it seems likely that this would happen only rarely and that the general effect of this biological complex is to diminish infestation in swine.

Summary.—Larval roundworms, found as aberrant parasites encysted in the wall of the digestive tract of Loggerhead Shrikes (*Lanius ludovicianus ludovicianus*), Screech Owls (*Otus asio asio*) and Red-tailed Hawks (*Buteo borealis borealis*) in southern Georgia and northern Florida, were identified by means of feeding experiments as *Physocephalus sexalatus*, the adult form of which occurs in the stomach of swine. The dung beetles, *Phanaeus carnifex* and *Canthon laevis*, were found to serve as the first and normal intermediate hosts of the parasite in this locality. Reëncystment of the larvae was found to occur in a wide variety of animals, including birds, mammals and reptiles. It is pointed out that beetle-consuming animals, of which birds are the most important, are therefore a significant factor in limiting the degree of infestation of swine with *Physocephalus sexalatus* in such an area.

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A PRELIMINARY STUDY OF THE EFFECTS OF TEMPERATURE ON THE TIME OF ENDING OF THE EVENING SONG OF THE MOCKINGBIRD.

BY JESSE M. SHAVER AND GLADYS WALKER.

THE twilight period or the time between day and night is a period of the greatest importance to students of bird activity. Here diurnal birds change their types of activity and gradually retire. Nocturnal birds awaken, become active and take the place of the diurnal group.

In view of the importance of this time region, it is strange that there has been so little investigation of the ecological factors involved. Why do song birds have an evening song? What are the daily recurring stimuli which give this reaction? Is this stimulus temperature, relative humidity, light, or some combination of these? What causes operate to end the song? To what is due its variable beginning and its variable ending on different days? These questions relate to just one activity, that of the evening song. (There are many other activities however related to the twilight region.) What answers can we give to these questions?

We know that there is some relation between the time of ending of the evening song of birds and sunset—at least for relatively normal spring days—due to the investigations of Wright and others. Wright[2] (1912, 1913), in gathering his data, was more interested in getting the relative time at which different birds stopped their evening song than in the meteorological conditions under which they sang.

Others however have observed the effects of meteorological factors on bird song in general. Bicknell[3] (1884) says, "The influence of almost impalpable meteorological changes on the

[1] Read at the Forty-seventh Stated Meeting of the American Ornithologists' Union, Philadelphia, October 23, 1929.

[2] Wright, Horace W. Morning Awakening and Even-Song. Auk, Vol. 29, pp. 307–325 (1912); Vol. 30, pp. 512–537 (1913).

[3] Bicknell, Eugene P. A Study of the Singing of Our Birds. Auk, Vol. 1, pp. 60–71. Also see his other papers in this series as follows: Auk, Vol. 1, pp. 126–140; 209–218; 322–332 (1884); Vol. 2, pp. 144–154; 249–262 (1885).

singing of birds cannot fail to have been remarked, and the effect of decided weather changes must often have been apparent even to the most unobservant."

Following this, Bicknell gives much general data on weather and especially climate and bird song. Little is given on the Mockingbird. Fowler[1] (1899) suggested that temperature was an important factor in influencing the singing of birds. Raspail[2] (1907) noted the very great decrease in song of birds during the cold, damp and cloudy season of 1907. The Alexanders[3] (1908) thought that the effect of weather on song was two-fold, (1) indirect, acting chiefly through the food supply, and (2) direct. In support of the first statement, they state that Robins and Hedge Sparrows stop singing when there is heavy frost. If, however, they are well-fed on crumbs, they will sing every day no matter how severe the weather. As an example of a direct effect, he mentions the Mistle Thrush, which ordinarily does not sing in winter, singing a great deal during the mild spells of December, 1907. There was just as much food on the bad days when it did not sing as on the good days when it sang.

Investigations on the influence of weather factors on the evening song of birds have been few.

Schwan[4] (1920) and Haecker,[5] (1924) regarded temperature and light—especially light—as the most important meteorological factors influencing the evening song. Alford[6] (1925) observed the effect of weather factors upon the time of ending of the evening song of the Song Thrush (*Turdus musicus clarkei*) from February 1 to June 10 for three years. He found that a clear or hazy sky was the most favorable factor for late song ending. The next factors in importance were wind force and wind direction. An increase

[1] Fowler, W. W. Songs of Birds Affected by Temperature. Zoologist, 1899, pp. 324–325. Cited from Zool. Rec., Vol. 36 (1899), Entry 221 under Aves.

[2] Raspail, Xavier. Influence Météorologique de l'Annee 1907 sur le Chant des Oiseaux. Paris, Bull. Soc. Zool., Vol. 32, pp. 131–135 (1907).

[3] Alexander, C. J. and H. G. Some Observations on the Song Period of Birds. British Birds, Vol. 1, pp. 367–372.

[4] Schwan, Albrecht. Vogelgesang und Wetter, physikalischbiologisch Untersucht. Pfluger's Archiv fur die gesamte Physiologie, Vol. 180, pp. 341–347 (1920).

[5] Haecker, V. Reizphysiologisches uber den Abendgesang der Vogel. Pfluger's Archiv. f. gesamte Physiologie, Vol. 204, pp. 718–725 (1924).

[6] Alford, C. E. Effect of Weather on the Song Impulse. British Birds, Vol. 18, pp. 306–312 (1925).

in wind force resulted in an early cessation of song. The most favorable wind was from the southeast and the next from the west or southwest. If other factors were favorable, then a rise or fall of temperature of some degrees was unfavorable.

Practically all students of this problem of evening song point out species differences in song reactions to weather factors. The Mockingbird might be expected to react differently from the Yellow-billed Cuckoo.

From this brief literature review, it is readily seen that most of the work on song and weather has been done under European meteorological conditions and with European species of birds. No work has been done under Tennessee weather conditions nor on the time of ending of the evening song of the Mockingbird (*Mimus polyglottos polyglottos*), so far as the authors are aware.

So the authors have set for themselves the task of analysing this one twilight activity—the ending of the evening song—of this one bird—the Mockingbird. For this first study in the series, they further limited themselves to the relation of this song activity to sunset and to temperature. Field observations were started by the junior author on October 23, 1928, and continued at intervals through April 20, 1929, a total of sixty-five evenings being spent in this manner. Each observation started at least thirty minutes before sunset and extended after sunset until sometime after the last bird call or note ceased.

A constant place for observation was used in order to make the data strictly comparable. The driveway back of the Gray building on the campus of George Peabody College for Teachers, Nashville, Tennessee, was selected because of accessibility and the number of Mockingbirds nearby.

Temperature readings were taken every fifteen minutes in the shade at a height of three feet from the ground with a standard Fahrenheit thermometer shaken to minimize radiation and insolation effects. The exact temperature for the time of ending of the song was determined by interpolation by a method described by Walker[1] (1929). The watch used to determine the exact time of

[1] Walker, Gladys. The Relation of Temperature, Relative Humidity and Wind Velocity to the Evening Song of Birds. Unpublished Master's thesis. George Peabody College for Teachers.

the ending of the evening song was checked daily by central standard time.

The data gathered in the field must now be studied in order to determine relationships. The data may first be displayed in graphs (Fig. 1). The time at which the Mockingbird ceases singing presents the usual fluctuating or saw-toothed curve. However, on the average this parallels sunset time to a remarkable degree and therefore is closely correlated with it. This fact makes it reason-

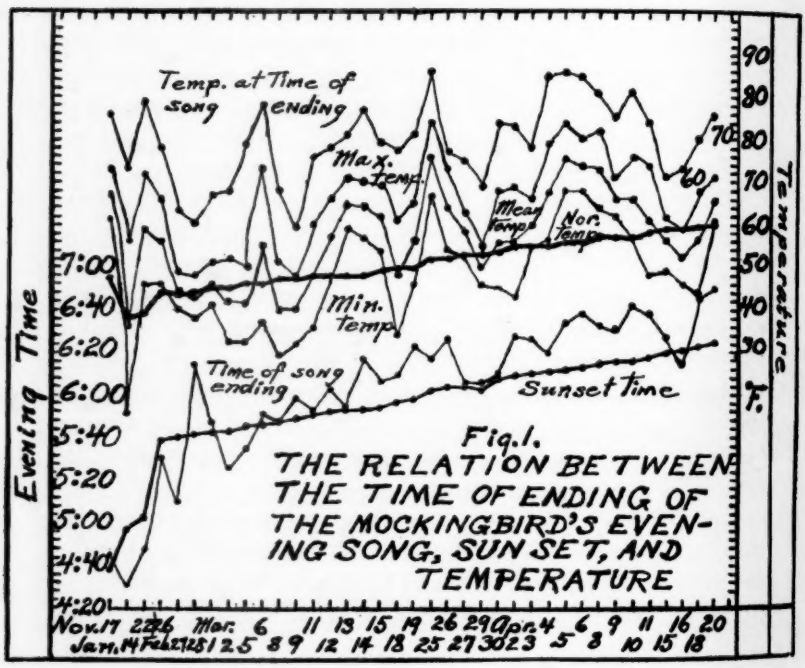

Fig. 1. THE RELATION BETWEEN THE TIME OF ENDING OF THE MOCKINGBIRD'S EVENING SONG, SUNSET, AND TEMPERATURE

ably certain that the cause or causes of the ending of the evening song of the Mockingbird are also highly correlated with sunset time. Many possible factors thus correlated suggest themselves, but only the one of temperature is being considered in this paper. Besides the temperature at the time of ending of the Mockingbird's song, maximum daily temperature, mean daily temperature, minimum daily temperature, and normal daily temperature, have been expressed in graphs in figure 1. (These last four groups of data were

kindly furnished by the Nashville Weather Bureau. Normal temperature is the average temperature for this date based on 58 years' records).

It is seen at once that all of the temperature curves, except the one of normal temperature, roughly parallel each other. In general, their trend is somewhat similar to that of normal temperature and therefore to sunset time, since normal temperature and sunset time are almost parallel to each other. This means, as regards their general trend, that these curves of temperature are all related to the time of ending of the evening song of the Mockingbird. In other words, the Mockingbird sings later in the evening when the average temperature is highest and stops singing earlier when the average temperature is lower. However the fluctuations in the temperature curves appear to be related to the fluctuation in the time of the song-ending curve in only a general way; there does not appear to be any very specific relation.

Since direct comparison of these temperature curves and the curve of the time of ending of the evening song of the Mockingbird is difficult, they were compared by a mathematical method—their product-moment correlation coefficients. Sunset time was also compared in this same manner with the time of ending of the Mockingbird's song. This last case might be used to illustrate the method of comparison. A ranking method was used (Table 1.)

This table is practically self-explanatory and so there will be no need to discuss it further except to point out the significance of the coefficient of correlation. Perfect correlation will give a coefficient (r) of 1.00, the absence of correlation will be indicated by 0, and perfect negative correlation by -1.00. The significance of the correlation depends in part on the size of the probable error and in part on the number of classes. This last factor is so small in this study as to make all results secured tentative.

The correlations obtained between time of ending of the Mockingbird's song and temperature by this method of study were as follows:

With temperature at the time of ending of the song,	$r = .27 \pm .10$
With daily maximum temperature,	$r = .41 \pm .09$
With daily mean temperature,	$r = .49 \pm .08$
With daily minimum temperature,	$r = .52 \pm .08$
With daily normal temperature,	$r = .81 \pm .08$

TABLE 1. ILLUSTRATING THE COMPUTATION OF THE PRODUCT-MOMENT CORRELATION COEFFICIENT.

Date	Time of Sunset (x)	Time of ending of Mocking-bird's song (y)	Deviation from assumed mean (d_x)		Deviation from assumed mean (d_y)		$(d_x)^2$	$(d_y)^2$	Product-moment ($d_x d_y$)	
Nov.			+	−	+	−			+	−
17	4:38	4:45		82		75	6,724	5,625	6,150	
Jan.										
14	4:55	4:31		65		89	4,225	7,921	5,785	
22	5:03	4:48		57		72	3,249	5,184	4,104	
Feb.										
26	5:39	5:30		21		30	441	900	630	
27	5:40	5:10		20		50	400	2,500	1,000	
28	5:41	6:15		19	15		361	225		285
Mar.										
1	5:42	5:47		18		13	324	169	234	
2	5:43	5:26		17		34	289	1,156	578	
5	5:45	5:35		15		25	225	625	375	
6	5:46	5:51		14		9	196	81	126	
8	5:48	5:47		12		13	144	169	136	
9	5:49	5:59		11		1	121	1	11	
11	5:51	5:52		9		8	81	64	72	
12	5:52	6:03		8	3		64	9		24
13	5:53	5:54		7		6	49	36	42	
14	5:53	6:17		7	17		49	289		119
15	5:54	6:06		6	6		36	36		36
18	5:57	6:09		3	9		9	81		27
19	5:58	6:23		2	23		4	529		46
25	6:03	6:17	3		17		9	289	51	
26	6:04	6:27	4		27		16	729	108	
27	6:04	6:05	4		5		16	25	20	
29	6:06	6:02	6		2		36	4	12	
30	6:07	6:10	7		10		49	100	70	

TABLE 1. ILLUSTRATING THE COMPUTATION OF THE PRODUCT-MOMENT CORRELATION COEFFICIENT—*Continued.*

Date	Time of Sunset (x)	Time of ending of Mocking-bird's song (y)	Deviation from assumed mean (d_x)	Deviation from assumed mean (d_y)	$(d_x)^2$	$(d_y)^2$	Product-moment ($d_x d_y$)
Apr.			+ −	+ −			+ −
2	6:09	6:28	9	28	81	784	252
3	6:10	6:26	10	26	100	676	260
4	6:11	6:20	11	20	121	400	220
5	6:12	6:35	12	35	144	1,225	420
6	6:13	6:39	13	39	169	1,521	507
8	6:15	6:33	15	33	225	1,089	495
9	6:16	6:31	16	31	256	961	496
10	6:16	6:42	16	42	256	1,764	672
11	6:17	6:38	17	38	289	1,444	646
15	6:20	6:27	20	27	400	729	540
16	6:21	6:14	21	14	441	196	294
18	6:23	6:46	23	46	529	2,116	1,058
20	6:25	6:51	25	51	625	2,601	1,275
Total	219:19	224:19	+ 232 − 393 = − 161	+ 564 − 425 = − 139	20,753	42,253	+ 26639 − 537 = + 26102
Mean	5:56	6:04	c_x = − 4.35 min.	c_y = 3.76 min.	560.891	1141.973	719.973
Assumed Mean	6:00	6:00	c_x^2 = 18.923	c_y^2 = 14.138	c_x^2 = 18.923	c_x^2 = 14.138	$c_x c_y$ = 16.356
$\sqrt{1127.835}$ or 33.583 = σ_y (Standard deviation)					541.968	1127.835	736.329

$\sqrt{541.968}$ or 23.2802 = σ_x (Standard deviation). $\sigma_x\sigma_y$ = 781.812

736.329 divided by $\sigma_x\sigma_y$ or 781.812 = .94 or r or coefficient of correlation

These coefficients are all suggestive but only the one with normal temperature is high enough to be regarded as significant. This high correlation was expected from the graph study (Fig. 1) since normal temperature parallels sunset time. In general then, average temperature (normal temperature in this case is the average of fifty-eight years) is most highly related to the time of ending of the Mockingbird's evening song, the song ending later when the average temperature is higher and earlier when the average temperature is lower.

The coefficients of correlation with temperature (temperature at time of the ending of the evening song, daily maximum temperature, daily mean temperature, and daily minimum temperature) are probably due to the fact that they are correlated with normal temperature. To determine to what extent this was the case, the influence of normal temperature on these correlations was eliminated by the statistical method of partial correlations. The method was as follows:

Let: 1 = Actual time of ending of the evening song of the Mockingbird
2 = The temperature at this time
3 = Normal temperature for the day

Then:

r_{12} = the correlation between 1 and 2 = .27
r_{13} = " " " 1 and 3 = .81
r_{23} = " " " 2 and 3 = .42

Substituting in the formula, $r_{12\cdot3} = \dfrac{r_{12} - r_{13}r_{23}}{\sqrt{(1-r^2_{13})\ (1-r^2_{23})}}$

$$r_{12\cdot3} = \frac{.27 - .81 \times .42}{\sqrt{(1-.81^2)\ (1-.42^2)}}$$

Solving $r_{12\cdot3} = -.13$ Too low to be of value.

The correlations obtained between time of ending of the Mockingbird's song and temperatures, when the relations of normal temperature to the other temperatures were controlled were as follows:

With temperature at the time of ending of the song,	$r_{12\cdot3} = -.13$
With daily maximum temperature,	$r_{12\cdot3} = .03$
With daily mean temperature,	$r_{12\cdot3} = .007$
With daily minimum temperature,	$r_{12\cdot3} = .08$

These coefficients are too low for consideration. This fact, in connection with the high correlation coefficient between time of the song ending and normal temperature, strongly suggests that this song ending is related to climatic or average temperature but not to the fluctuating temperature from day to day.

However the preceding analyses do not show whether the Mockingbird stops singing later after sunset on warm days than on cold ones. They show that he sings later on warm days but sunset time is left out of the picture. By recording the deviations of the time as minus when the song ends before sunset and plus when the song ends after sunset, the data are brought into relation to sunset time.

Now a scatter diagram, such as is used by statisticians and has been used by Alford (1925) in his study of the Song Thrush, in which the time of ending of the song in relation to sunset is graphed against temperature, may be used to picture the relationship here. Such a diagram, using the temperature at the time of ending of the evening song (Fig. 2) shows the relation of temperature to the time of song ending.

The nearer all points fall to a straight line the higher the correlation. From this fact, it is readily seen that a correlation exists in time of ending of the evening song of the Mockingbird from sunset but that it is not high. Since the other temperature factors give, with the time of ending of the evening song, a somewhat similar type of scatter, their scatter diagrams need not be given here. Instead the relations between the various temperatures and the time of ending of the evening song of the Mockingbird from sunset time might be conveniently summarized by means of coefficients of correlation as follows:

Correlation of time of ending of the evening song of the Mockingbird from sunset time with:

Temperature at time of ending of the song,	$r = .57 \pm .07$
Maximum temperature of day,	$r = .55 \pm .07$
Mean daily temperature,	$r = .52 \pm .07$
Minimum daily temperature,	$r = .46 \pm .08$
Normal daily temperature,	$r = .50 \pm .08$

These correlations strongly indicate a positive influence of temperature, the Mockingbird singing later after sunset on warm days and earlier on cold days.

However sudden and decided changes in temperature might conceivably be found to be significant, for Eagle Clarke[1] (1896, 1912) found these to be quite significant in initiating migration in both the autumn and spring season. These results were later confirmed by Cooke[2] (1913). Since Clarke compared the mean temperature

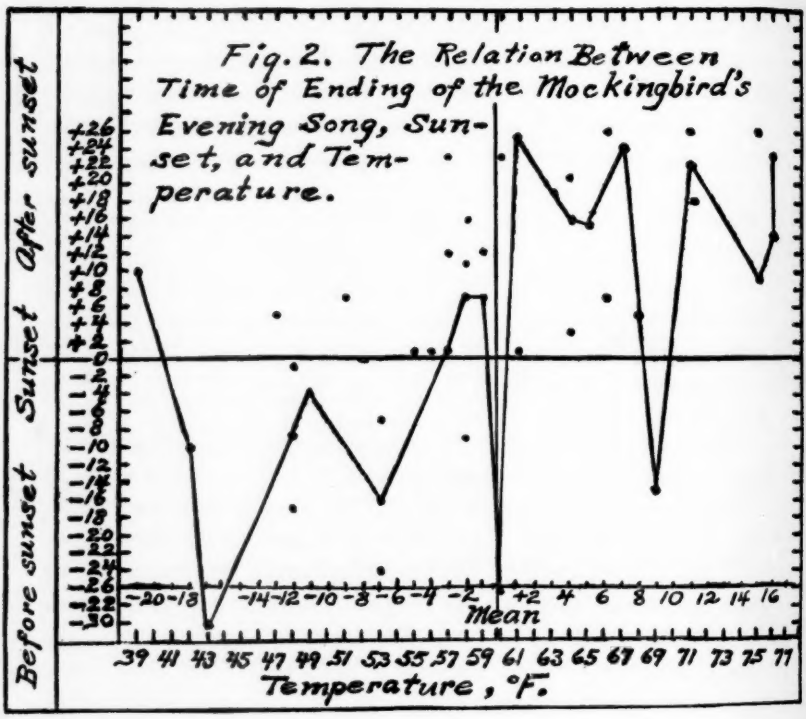
Fig. 2. The Relation Between Time of Ending of the Mockingbird's Evening Song, Sunset, and Temperature.
Before sunset Sunset After sunset
+26 +24 +22 +20 +18 +16 +14 +12 +10 +8 +6 +4 +2 0 −2 −4 −6 −8 −10 −12 −14 −16 −18 −20 −22 −24 −26 −28 −30
−20 −18 −14 −12 −10 −8 −6 −4 −2 +2 4 6 8 10 12 14 16
Mean
39 41 43 45 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77
Temperature, °F.

of the day with that of the preceding day, this method was first tried with our Mockingbird song data using Weather Bureau means. Daily mean temperature deviations were recorded as plus or minus and then compared with the song time deviations, from sunset (Fig. 2). These graphs indicate no relation between mean daily

[1] Clarke, W. Eagle. Effect of Weather on Birds. Rep. Brit. Assoc. Adv. Sci., 1896, pp. 451–477. Also see volume one, pages 171–187, of his three volumes, Studies in Bird Migration (1912).

[2] Cooke, Wells W. The Relation of Bird Migration to the Weather. Auk, Vol. 30, pp. 205–221.

temperature changes and the time of ending of the Mockingbird's song. Calculation of the coefficient of correlation gave r = .12. This is too low to be significant.

A similar temperature comparison was made between the deviations of the temperature at the time of ending of the Mockingbird's song *from* the daily mean temperature *and* the deviations of the time of ending of the song from sunset. The result was, r = −.11, and therefore of no significance.

On reflection, it appeared likely that small changes of temperature might have less value proportionately than great changes or they might have no effect whatever, even serving to neutralize the effect of the big changes. With this in mind, all mean daily temperature deviations of less than 5 degrees Fahrenheit from the preceding day, were eliminated and the coefficient of correlation determined for the remaining mean temperatures. It was, r = .11 and therefore of no significance. An examination of the few cases where the temperature deviations were as great as 10 degrees Fahrenheit indicated no relation here.

Another method of studying temperature relations used was to compare the temperature at the time of ending of the evening song with the temperature at sunset. These curves show that the temperatures of the two curves are practically the same throughout the period of study. In thirty-one cases, they were the same, or differed by less than half a degree (the thermometers used could be read accurately only to a half a degree), in the two curves; in six cases, they differed by as much as one degree. There were no greater differences. This renders valueless a comparison of temperature deviations from sunset temperature with time of ending of the Mockingbird's song from sunset time.

SUMMARY.

1. Field observations were made of the time of ending of the evening song of the Mockingbird and temperature at Nashville, Tennessee, from October 23, 1928 to April 30, 1929, a total of sixty-five evenings—mainly in February, March, and April—being spent in this way.

2. The time of ending of the evening song of the Mockingbird is highly correlated with the time of sunset, the correlation being .94 ± .01. Perfect correlation would be 1.00.

3. There is little relation between the temperature at the time of song ending and the time of ending of the Mockingbird's evening song. The coefficient of correlation here is .27 ± .10.

4. Maximum, minimum, mean, and normal temperatures were also found to be correlated with the time of ending of the evening song of the Mockingbird in this order: .41, .52, .49, and .81. This last correlation indicates the importance of average temperature on this activity. On the average the Mockingbird sings later on warm days and stops earlier on cold days.

5. There is no particular virtue in any one of these temperature groups over the others unless it be that of normal temperature. The correlations of song ending with maximum, minimum, and mean temperatures and with the temperature at the time of song ending are largely expressions of their correlations with normal temperature. This was indicated by eliminating the influence of normal temperature mathematically by the method of partial correlations.

6. Neither small nor large changes in mean temperature from the preceding day are related to changes in time of ending of the song of the Mockingbird. With changes of five degrees F. or more, the coefficient of correlation is .11; with all changes it is .12.

7. The deviations of the temperature at the time of the ending of the Mockingbird's evening song from the daily mean temperatures has no significant correlation with the time of ending of this song for $r = -.11$.

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TWO AND A HALF YEARS OF BIRD MIGRATION AT CLEMSON COLLEGE, S. C.

BY GEORGE E. HUDSON.

THE following tables contain migration data collected by the writer in the vicinity of Clemson College, S. C., during the period from February 1926 to June 1928.

In gathering these data about eight hundred specimens were collected, most of which are now in the collection of the Division of Entomology and Zoology of the Clemson Agricultural College of South Carolina.

In considering the fall migration table, it should be noted that in the case of the winter visitants, the date of arrival and date of departure for any one year are not for one continuous season; the date of arrival being for one season, and the date of departure for the preceding season.

Accounts of the capture of the more uncommon species occurring in this list have already been published in 'The Auk,' except in the case of the Bartramian Sandpiper, of which only one specimen was taken. The late Arthur T. Wayne informed me that this bird is becoming very rare in this part of the country, although he remembers when it was abundant at Mount Pleasant, S. C.

The capture of the Brewer's Blackbirds was reported by Sherman and the writer in 'The Auk,' October 1927. The Nashville, Wilson's, and Connecticut Warblers were reported by the writer in 'The Auk,' January 1928. This is the only authentic record of the Nashville Warbler for South Carolina.

Several typical specimens of Cairns' Warbler (*Dendroica caerulescens cairnsi*) were also taken, but as this sub-species could not be distinguished in life from the typical form, no effort was made to separate the dates of arrival and departure of the two. The validity of the form *cairnsi* is questioned by many ornithologists, and the distinguishing characters thought to be merely individual, instead of being of sub-specific importance.

The American Egret and Little Blue Heron cannot be considered as spring migrants, for they merely wander up from the coastal region after the breeding season.

The list of permanent residents is based on the writer's observations, and on information contained in works[1] on the birds of this region. Some of the species contained in this list are rather irregular in their occurrence, and do not breed, but may be expected at any season of the year; the Great Blue Heron is an example. The Broad-winged Hawk, Barn Owl, and Ruffed Grouse are included in this list on the authority of Prof. F. Sherman. The last named species occurs in this region only in the mountains, however.

This article makes no pretence of covering all of the species on record for this region, but only those recorded during the period mentioned. Observations were made only during the school year (September to June), hence dates of departure are wanting for the summer residents that leave early.

LIST OF PERMANENT RESIDENTS.

Wood Duck.
Great Blue Heron.
King Rail.
American Woodcock.
Killdeer Plover.
Bobwhite.
Ruffed Grouse.
Mourning Dove.
Turkey Vulture.
Black Vulture.
Cooper's Hawk.
Red-tailed Hawk.
Red-shouldered Hawk.
Broad-winged Hawk.
Sparrow Hawk.
Barn Owl.
Barred Owl.
Screech Owl.
Belted Kingfisher.
Southern Hairy Woodpecker.
Southern Downy Woodpecker.
Phoebe.
Blue Jay.
Crow.
Starling.
Red-winged Blackbird.
Meadowlark.
Purple Grackle.
English Sparrow.
Goldfinch.
Grasshopper Sparrow.
Field Sparrow.
Towhee.
Cardinal.
Loggerhead Shrike.
Pine Warbler.
Mockingbird.
Brown Thrasher.
Carolina Wren.
Bewick's Wren.
White-breasted Nuthatch.
Brown-headed Nuthatch.

[1] 'Birds of South Carolina,' by Arthur T. Wayne; and "Birds of North Carolina," by T. Gilbert Pearson, H. H. Brimley, and C. S. Brimley.

Pileated Woodpecker.
Red-headed Woodpecker.
Red-bellied Woodpecker.
Flicker.
Tufted Titmouse.
Carolina Chickadee.
Robin.
Bluebird.

FALL MIGRATION AT CLEMSON COLLEGE, S. C., WITH EXTREME DATES OF ARRIVAL AND DEPARTURE.

Name of Bird	Earliest Date		Latest Date		
	1926	1927	1926	1927	1928
Grinnell's Water-Thrush	Sept. 13	Oct. 4	.....	.....	.....
Tennessee Warbler	Sept. 17	.....	Sept. 21	.....	.....
Chestnut-sided Warbler	Sept. 17	Sept. 20	Oct. 26	Oct. 15	.....
Magnolia Warbler	Sept. 18	Sept. 29	Oct. 12	Oct. 15	.....
Marsh Hawk	.....	Oct. 1[1]	May 16	April 18[1]	Mar. 16
Gray-cheeked Thrush	.....	Sept. 23	.....	Oct. 17	.....
Sharp-shinned Hawk	.....	Sept. 24	.....	April 27[1]	April 24
Olive-backed Thrush	.....	Sept. 27	.....	Oct. 18	.....
Wilson's Thrush	.....	Sept. 29	.....	.....	.....
Rose-breasted Grosbeak	Oct. 2	Oct. 1	.....	Oct. 15	.....
Cedar Waxwing	Nov. 16	Oct. 7	May 27	May 25	May 25
Yellow-bellied Sapsucker	Oct. 9	Oct. 13	.....	Mar. 30	April 3
Palm Warbler	Oct. 9	.....	.....	April 27	.....
Black-throated Blue Warbler	Oct. 17	Oct. 11	Oct. 30	Oct. 17	.....
Brown Creeper	Oct. 30	Oct. 11	.....	Mar. 6	April 8
Savannah Sparrow	Nov. 2	Oct. 13	Mar. 13	April 29	April 24
Ruby-crowned Kinglet	Nov. 20	Oct. 13	April 21	April 21	April 24
Black-throated Green Warbler	.....	Oct. 14	.....	.....	.....
Winter Wren	Oct. 30	Oct. 14	.....	April 11	April 24
White-throated Sparrow	Oct. 17	Oct. 15	May 16	May 1	May 15
Song Sparrow	Oct. 26	Oct. 15	.....	April 23	
Myrtle Warbler	Oct. 25	Oct. 15	April 21	April 27	May 10
House Wren	Oct. 17	.....	.....	.....	.....
Golden-crowned Kinglet	Oct. 26	Oct. 18	.....	Feb. 9	April 6
Hermit Thrush	Oct. 30	Oct. 18	April 28	April 25	April 17
Rusty Blackbird	Dec. 4	Oct. 19	.....	Dec. 13	.....
Vesper Sparrow	Nov. 17	Oct. 27	April 21	April 23	April 13
Coot	.....	Nov. 3	.....	.....	.....
Slate-colored Junco	Nov. 5	Nov. 6	April 21	April 11	April 13
Canada Goose	Nov. 17	Nov. 7	.....	Feb. 18	.....
Mallard Duck	Dec. 11	Nov. 11	.....	Feb. 24	April 18[1]
American Pipit	Nov. 16	Nov. 9	Mar. 13	April 15	Mar. 9
Lesser Scaup Duck	Nov. 16	.....	Dec. 7	.....	.....
Fox Sparrow	Dec. 11	Nov. 23	Feb. 20	Mar. 14	Mar. 29
Purple Grackle	Nov. 23	Nov. 2	Mar. 13	May 9[1]	Mar. 29
Bronzed Grackle	Nov. 27	.....	Mar. 13	.....	.....
Brewer's Blackbird	Dec. 18	.....	April 17[1]	.....	.....

[1] (By Prof. F. Sherman).

SPRING MIGRATION AT CLEMSON COLLEGE, S. C., WITH EXTREME DATES OF ARRIVAL AND DEPARTURE.

Name of Bird	Earliest Noted			Latest Noted		
	1926	1927	1928	1926	1927	1928
Rusty Blackbird	....	Feb. 12	Feb. 24	....	Feb. 27	March 23
Cowbird	March 13	Feb. 25	March 2	....	May 23	April 3
Wilson's Snipe	....	March 2	March 13	April 21	April 7	March 29
Chipping Sparrow	March 13[1]	March 17	March 28	....	Nov. 10	....
Rough-winged Swallow	April 10	April 6	March 16	....	....	....
Black and White Warbler	March 20	March 19	March 28	Sept. 13	Oct. 11	....
Orange-crowned Warbler	....	....	March 23	....	....	....
Maryland Yellow-throat	....	March 26	March 28	Oct. 2	Oct. 13	....
Blue-gray Gnatcatcher	April 6[1]	March 27	March 28	....	....	....
Louisiana Water-Thrush	....	April 6	March 28[1]	....	....	....
Mountain Solitary Vireo	....	....	March 29	....	Oct. 29	....
White-eyed Vireo	April 6[1]	April 6	March 29	....	Sept. 15	....
Coot	....	....	March 30	....	....	April 7[1]
Purple Martin	....	....	March 30	....	....	....
Chimney Swift	April 10	April 5[1]	April 2	Oct. 12	Oct. 16	....
Hooded Warbler	April 10	April 6	April 3	Sept. 28	Oct. 15	....
Black-throated Green Warbler	April 10	April 4[1]	April 22[1 2]	April 27[1]	....	April 27[1 2]
Red-eyed Vireo	....	April 6	April 17	Oct. 2	Oct. 11	....
Yellow-throated Vireo	April 6[1]	April 16	April 6	....	....	....
Yellow Palm Warbler	....	....	April 6	....	....	April 7
Yellow-throated Warbler	....	April 15	April 6	....	....	....
Wood Thrush	April 11[1]	April 6	April 12	Oct. 12	Oct. 15	....
Spotted Sandpiper	April 21	April 13	April 7[1]	May 15	May 21	April 24
Lesser Scaup Duck	....	April 9	....	....	....	....
Whip-poor-will	April 21	April 9	May 1	Sept. 18[1]	....	....
Parula Warbler	April 10	April 9	April 12	Sept. 28	Sept. 15	....
Greater Yellow-legs	....	April 10	....	....	April 12	....

[1] (By Prof. F. Sherman)

[2] (By Prof. H. A. Rankin)

SPRING MIGRATION—CONTINUED.

Name of Bird	Earliest Noted			Latest Noted		
	1926	1927	1928	1926	1927	1928
Ruby-throated Hummingbird	April 10[1]	April 12	April 21	Sept. 14	Sept. 24	....
Grinnell's Water-Thrush	....	April 10	April 13	May 22	April 21	April 17
Prairie Warbler	April 21	April 11	April 17	Sept. 21	Sept. 13	....
Redstart	April 11[1 2]	April 14	April 17	Oct. 12	Oct. 1	....
Green Heron	....	April 12	April 24	....	Sept. 28	....
Crested Flycatcher	April 21	April 13	April 20	....	....	....
Ovenbird	April 13[1]	April 13	April 17	....	Oct. 17	....
Long-billed Marsh Wern	....	April 13	....	....	April 25	....
Red-breasted Nuthatch	....	April 13	....	....	....	....
Summer Tanager	April 19[1]	April 15	April 17	....	Sept. 20	....
Black-throated Blue Warbler	April 21	April 15	April 20	....	May 9	May 15
Kingbird	April 21	April 17	May 4	....	....	....
Scarlet Tanager	April 21[1]	April 17	April 18[1 2]	....	May 12	May 15
Cape May Warbler	April 21[1]	April 18	April 17	....	May 17	May 15[1]
Yellow Warbler	April 21	April 18[1]	April 17	....	....	....
Kentucky Warbler	....	April 17	May 1	....	....	....
Catbird	April 24	April 17	April 19	Sept. 28	Oct. 14	....
House Wren	....	April 17	April 17	....	April 27	May 1
Indigo Bunting	April 24	April 18[1]	April 24	Oct. 17	Nov. 3	....
Yellow-breasted Chat	April 24	April 18	April 24	....	....	....
Rose-breasted Grosbeak	April 19	....	May 1	May 4[1]	May 2[1]	May 11
Baltimore Oriole	....	April 20	April 23	....	May 9	....
Cliff Swallow	April 20[1]	....	....	....	....	....
Solitary Sandpiper	April 21	May 2	....	May 15	....	....
Wood Pewee	....	April 21	April 22[1 2]	Oct. 8	Oct. 11	....
Worm-eating Warbler	May 1	April 21	April 22	Sept. 21	....	....
Cerulean Warbler	April 21[1]	....	....	....	....	....

[1] (By Prof. F. Sherman)

[2] (By Prof. H. A. Rankin)

SPRING MIGRATION—CONTINUED.

Name of Bird	Earliest Noted			Latest Noted		
	1926	1927	1928	1926	1927	1928
Blackburnian Warbler	April 21	....	April 24[1 2]	....	May 11	April 27[1 2]
Olive-backed Thrush	April 21	May 4	May 1	May 3	May 20	May 15
Acadian Flycatcher	....	May 2[1]	April 22	....	....	....
Orchard Oriole	May 4[1]	April 23	April 22	....	....	....
Black-poll Warbler	May 1	May 1	April 22	May 24	May 17	May 24
Barn Swallow	....	April 23	May 1	....	....	May 12
Black-crowned Night Heron	April 24	....	May 1	....	....	....
Bartramian Sandpiper	....	....	April 24	....	....	....
Bobolink	May 16	April 29	April 24	May 26	May 9[1]	May 18
Blue Grosbeak	April 24	April 27[1]	May 4	....	....	....
Chestnut-sided Warbler	April 27[1]	April 25	April 27[1 2]	....	May 17	May 15
Nashville Warbler	....	April 27	....	....	....	....
Bay-breasted Warbler	May 16	May 9	May 1	....	....	May 11
Canadian Warbler	May 2	May 11	....	May 23	May 21	....
Gray-cheeked Thrush	....	May 3	....	....	May 4	....
Nighthawk	May 16	May 6	May 5[1]	Sept. 24	Oct. 9	....
Yellow-billed Cuckoo	May 16	May 6	May 14	....	Sept. 29	....
Black-billed Cuckoo	May 17	May 6	May 15	....	....	....
Wilson's Thrush	May 8	....	....	May 24	....	....
Magnolia Warbler	....	May 9	May 11	....	....	....
Wilson's Warbler	May 14	May 17	....	....	....	....
Chuck-wills-widow	....	May 17	....	....	May 20	....
Least Sandpiper	May 19	....	....	May 27	....	....
Connecticut Warbler	....	May 20	....	....	....	....
Little Blue Heron	....	July 4[1]	....	....	....	....
American Egret	....	July 27[1]	....	....	....	....

[1] (By Prof. F. Sherman)

[2] (By Prof. H. A. Rankin)

THE SCREECH OWLS OF EASTERN NORTH AMERICA.

BY OUTRAM BANGS.

Ridgway's treatment, of the Screech Owls of Eastern North America in 'Birds of North and Middle America' (Bull. U. S. Nat. Mus. No. 50, part, 6, 1914), does not appear to me to quite express the facts as they really are. Before this was written, it was the custom to call the more northern form *Otus asio asio* (Linnaeus) and the Florida bird, *Otus asio floridanus* (Ridgway). Ridgway dropped *floridanus*, called the northern bird *Otus asio naevius* (Gmelin) and used the old name *Otus asio asio* (Linnaeus) for all Screech Owls from Florida north to Virginia and west to western Tennessee, southern Illinois, southeast Kansas, Oklahoma, Arkansas, Louisiana, etc. Ridgway, however, does not mention, nor does he list measurements of any birds from Georgia, South Carolina of North Carolina; apparently at that time he lacked material from this most important region.

A study of the material in the Museum of Comparative Zoology leads me to believe that three instead of two forms should be recognized. Our material is very complete so far as the eastern tier of states is concerned. From the Mississippi Valley region however, we have unfortunately, only scattering specimens, with no series from any one place.

The Screech Owl is nonmigratory. Wherever it occurs it is present in about the same numbers throughout the year. It is therefore safe to say that any specimen, wherever taken, regardless of season, represents the resident form of the region whence it came.

The three eastern races, according to my views, are as follows:—

Otus asio naevius (GMELIN)

Strix naevia Gmelin, S. N. 1, pt. 1, 1788, p. 289. Type Locality, New York.

Range:—From southern New Brunswick and Maine south in the east to New Jersey, at least (rare at the north, abundant from southern New Hampshire south), west to Wisconsin, Minnesota and South Dakota. Birds from Ohio, Indiana and northern Illinois, belong here. Details of the range of the form in the Mississippi Valley etc., must be worked out with the aid of much more material than is available to me.

Characters:—Size large in 45 skins from New Hampshire, Massachusetts, Connecticut, New York, New Jersey and Pennsylvania. Wing in ♂, 160 to 168, (mostly about 165). In ♀, 165 to 177, (mostly about 170).

Underparts in both phases, the red and the gray, coarsely marked with much white intermixed and with a large area of plain white in the middle of the belly. (For full description see Ridgway, 'Birds of North and Middle America,' part 6, 1914).

Otus asio asio (LINNAEUS)

Strix asio Linnaeus, S. N. ed. 10, 1, 1758, p. 92. Type Locality, South Carolina.

Range:—In the east from Georgia north to Virginia, and west to western Tennessee, southern Illinois, southeastern Kansas, Oklahoma, Arkansas, Louisiana, etc. Intergradation in the east takes place gradually in the region lying between Virginia and New Jersey. In the west, skins from southern Illinois and Kansas and southward are wholly referable here.

Characters:—Size decidedly smaller; Wing in ♂ from Georgia 149, in ♀ 153 (one each); from South Carolina, in ♂ 150 to 155 (three) in ♀ 160 to 167 (three); from North Carolina, in ♂ 150 to 155 (four), in ♀ 157 to 167 (four); from Virginia, in ♂ 156 and 160 (two) in ♀ 166 (one). One male from Kansas has a wing of 150 and one ♂ from southern Illinois 154. (Other unsexed specimens afford similar measurements).

In color and markings quite the same as *O. a. naevius*.

Otus asio floridanus (RIDGWAY)

Scops asio var. *floridanus* Ridgway, Bull. Essex Inst., 5, 1873, p. 200. Type Locality, Indian River, Florida.

Range:—Peninsular Florida. Intergradation with the last form apparently takes place rather gradually, as two birds from Georgia (Broro Neck and Sapelo Island) are somewhat intermediate in color, but are larger than in *floridanus* and one bird out of six from southern South Carolina, though much larger than Florida examples, somewhat resembles them in markings. All others from southern South Carolina are quite the same as those from farther north.

Characters:—Size very small; in 30 skins from the Florida Peninsula, wing in ♂ 134 to 144 (mostly about 140). In ♀ 140 to 152 (mostly about 145). In markings standing off sharply from the other two forms, in that the underparts are much more heavily and finely penciled with less intermixture of white and with less white in middle of belly.

Museum of Comparative Zoology,
Cambridge, Mass.

THE IDENTITY OF THE TOUCANS DESCRIBED BY LINNAEUS IN THE 10TH AND 12TH EDITIONS OF THE SYSTEMA NATURAE.

BY JAMES L. PETERS.

EDITION 10.

RAMPHASTOS PIPERIVORUS. R. rostro nigro: carina crassisima. *Habitat* in America meridionali.

This is the entire diagnosis given for the species; there are no included references to other writers or plates. It is absolutely unidentifiable.

RAMPHASTOS TUCANUS. R. rostro rubro carina obtusa alba. *Habitat* in America meridionali. Maxillae versus basin fascia nigra.

In this case likewise there are no references given but there cannot be the slightest doubt that this name is applicable to the species now currently called *Ramphastos monilis* P.L.S. Muller. Gould called attention to this in the second edition of his 'Monograph of the Ramphastidae' and refrained from using the name only because of certain pre-Linnean nomenclatural complications in force at the time, but which do not apply any longer. Recently Hartert (Nov. Zool., 32, 1925, p. 143) has tried to show that *tucanus* is "absolutely doubtful." It seems to me however that the description of the bill given by Linnaeus can fit no other species, besides it was the one best known in Europe in those days. The figure published by Petiver in 1709 is certainly identifiable as this species.

RAMPHASTOS PICATUS. R. rostro rubro apice nigro: carina compressa. *Pica brasiliensis*, Alb. av. 2 p. 24 t. 25; Aldr. orn. 1. l. 20 c. 19, [this reference is wrong and was corrected in ed. 12 to 1, p. 801 which equals book 12 chap. 19]. *Habitat* in America meridionali. Rostrum magnum inter congeres; etiam basi nigricans.

The remarks as to the large size of the bill were no doubt induced by the very great exaggeration of that member in Aldrovandus' plate. Albin's plate is much better proportioned. The bird however bears no resemblance to any known species: it was probably an artifact.

RAMPHASTOS ARACARI. R. rostro nigro: maxilla superiore lateribus alba, basi triloba. Toucan, Edw. av. 64 t. 64. Aracari, Marcgr. bras. 217; Raj. av. 44. *Habitat* in America meridionali. Maxilla superior ad nares triloba, quod non in reliquis, fasci abdomines anoque sanguineis.

The diagnosis and the last two references can apply only to the bird known today as *Pteroglossus aracari aracari* (Linn.). Edwards' "Toucan" is unidentifiable. Except for the white throat the bird might be *Ramphastos brevicarinatus* Gould. Edwards' plate was drawn from a cage bird from some part of the Spanish mainland. I fail to see how it can serve as the basis for the name of any species known today. It may be safely disregarded as having no bearing on this Linnean species or on others in the 12th edition.

EDITION 12.

RAMPHASTOS VIRIDIS. R. viridis, abdomine flavo; uropygio rubro. *Tucana cajenensis viridis* Briss. av. 4 p. 423 t. 433.

Tucan pectore flavo. Edw. av. 253 t. 329. *Habitat* in Cayana.

This is another composite. The diagnosis and Brissonian reference apply to the bird known today as *Pteroglossus viridis* (Linn.) and this name will continue to stand. Edwards figured and described a bird that is without doubt the species later named by Gould *Ramphastos brevicarinatus.*

RAMPHASTOS PIPERIVORUS, based on Edwards' pl. 330 and Brisson 4, p. 429, pl. 32, f. 2, is the bird now called *Selenidera culik* (Wagl.)

Unfortunately the certainly identifiable *R. piperivorus* of the 12th edition is preoccupied by *R. piperivorus* of the 10th edition, the brief diagnosis (see *antea*) being that of a very different species.

RAMPHASTOS ARACARI: Virtually the same as *R. aracari* of edition 10.

RAMPHASTOS PISCIVORUS: R. nigricans fascia abdominali crissoque rubris, uropygio albo. *Tucana* f. *Pica brasiliensis,* Edw. Av. t. 64. *Tucana brasiliensis gutture albo,* Briss. av. 4, p. 413. *Picus americanus,* Hern. Mex. 697. *Xochitenacatl tertia,* Raj. Av. 178. *Habitat* in America australi. Rostrum luteum macula coccinea in apice; mandibula inferior caerulea, Pedes caerulei, Nigra pileus dorsum, alae, cauda, venter, femora. Albida tempora, gula, pectus, uropygium. Rubra fascia pectoralis & crissum.

This name is a hopeless composite. The description cannot apply to any Toucan with a sufficient degree of accuracy to permit its being used. It certainly cannot be the *Ramphastos* from southern Mexico, for that bird has a yellow throat with the red posterior margin obsolete or often lacking. As I have shown, Edwards' plate 64 is not recognizable. Brisson's bird is absolutely indeterminable based as it is on Edwards; Fernandez's *Picus americanus,* also a composite, and Raj also taken from Fernandez.

RAMPHASTOS CALLORHINCHUS Wagl., Syst. Av. 1827 *Ramphastos* sp. 6 is based on Linnaeus' description and Edwards' plate and is simply a new name for *piscivorus.*

Lesson's *Ramphastos sulfuratus*[1] appeared on p. 173 in the third part of his Traité' d'Ornithologie published in July 1830. The description is brief but can apply only to the large Toucan of southern Mexico (Habite le Mexique). Lichtenstein's *Ramphastos poecilorhynchus* appeared in the Preiz. Verz. Mex. Vög., likewise published in 1830 but the exact date is not known. The only description, "Brust schwefelgeld, Bauch Schwarz; Nacken braunroth," is entirely applicable. With two available names published in the same year, the actual date of only one being known, I should certainly make use of that one, particularly when it appeared in a standard work such as Lesson's 'Traité.'

The races will therefore stand:

Ramphastos sulfuratus sulfuratus Less.

Southeastern Mexico to Guatemala and British Honduras.

Ramphastos sulfuratus brevicarinatus Gould.

Southeastern Guatemala (specimen in M.C.Z. examined). South to northern Colombia.

RAMPHASTOS TUCANUS. Having established the identity of this name in edition 10, it is of no real concern what it represents in edition 12: as a matter of fact it is the same bird more fully described and with references added. The reference to Edwards' plate 238 is sufficient to definitely fix its identity.

RAMPHASTOS PICATUS is preoccupied by the unidentifiable monstrosity of edition 10.

[1] Van Tyne, (Museum of Zoology, University of Michigan, Misc. Publ. no. 19, 17 Jan. 1929, p. 7) has indicated that this name should replace *piscivorus.*

RAMPHASTOS DICOLORUS: R. nigricans, pectore abdomine crisso uropygioque rubris, gula lutea. *Tucana cayenensis, gutture luteo,* Briss. av. 4, p. 111 t. 31, f. 1. *Tucan pectore flavo,* Edw. av. 330 t. 329. *Habitat* in Cayana.

This species is another composite. For the identity of Edwards' plate 329 see under *R. viridis.* The description and Brissonian reference agree minutely with the bird now known under this name and the identity if the composite may be determined from those elements, no change in nomenclature being necessary. "Cayana" is wrong as the type locality, Cory in 1919 substituting southeastern Brazil.

To summarize briefly:

Ramphastos piperivorus of ed. 10 is unrecognizable.

Ramphastos tucanus of ed. 10 = *R. tucanus tucanus* Linn. and replaces *R. monilis* P.L.S. Mull.

Ramphastos picatus of ed. 10 is unrecognizable, perhaps an artefact.

Ramphastos aracari of ed. 10 = *Pteroglossus aracari aracari* (Linn.).

Ramphastos viridis of ed. 12 = *Pteroglossus viridis viridis* (Linn.).

Ramphastos piperivorus of ed. 12 is preoccupied by the same name in ed. 10. It is the same as the bird now called *Selenidera culik* (Wagl.).

Ramphastos aracari of. ed. 12 = *R. aracari* of ed. 10.

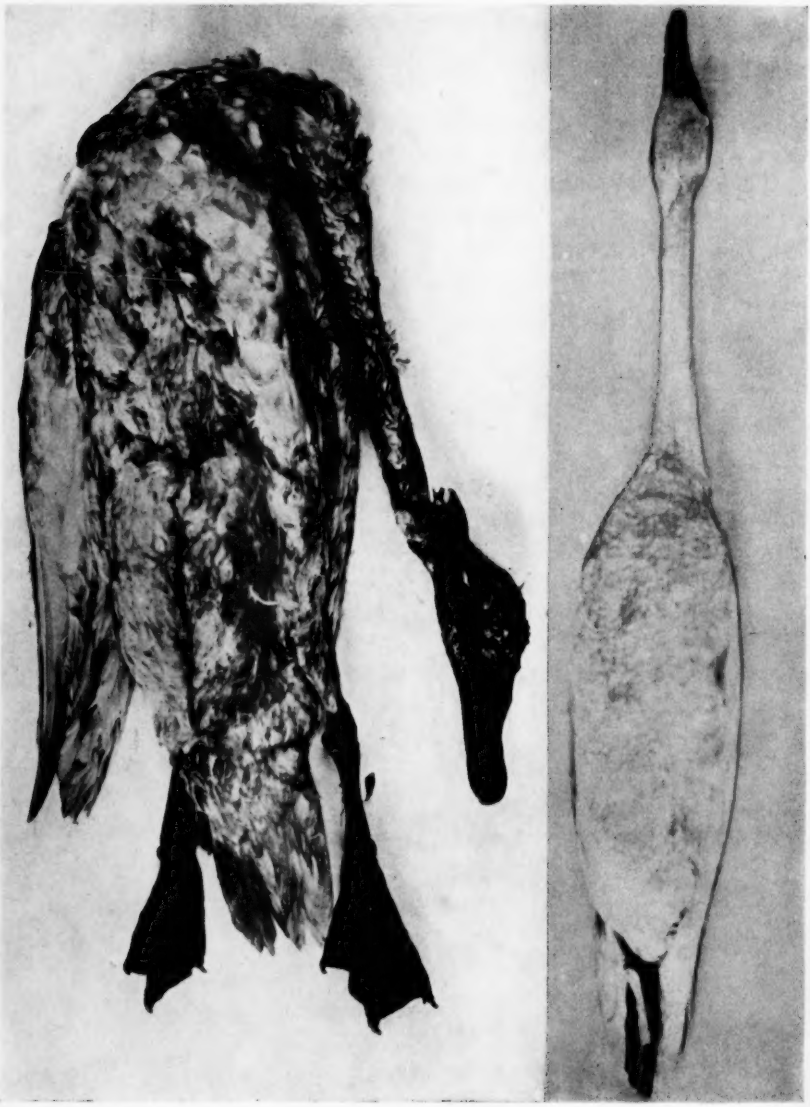
Ramphastos piscivorus is an unidentifiable composite with not a single positive element.

Ramphastos tucanus of ed. 12 = *R. tucanus* of ed. 10.

Ramphastos picatus of ed. 12 is preoccupied.

Ramphastos dicolorus of ed. 12 = *Ramphastos dicolorus* Linn.

Museum of Comparative Zoology,
Cambridge, Mass.



1. DISMOUNTED SPECIMEN OF WHISTLING SWAN OBTAINED ON THE COLUMBIA RIVER, FEBRUARY 10, 1836, BY J. K. TOWNSEND.
2. THE SAME SPECIMEN CLEANED AND REMODELLED, 1930.

A METHOD OF SALTING AND PREPARING WATER BIRD SKINS.

BY WHARTON HUBER.

Plate XII.

As we have received many inquiries as to the method employed at the Academy of Natural Sciences of Philadelphia in salting water bird skins for temporary preservation and their subsequent preparation for study specimens I submit the following outline, including some account of the relaxing, cleaning and remodelling of old dirty and grease-soaked specimens.

Skin the birds in the usual manner leaving the fat on the skin. Leave in all wing bones including humerus. Be sure to skin the head thoroughly, loosening the skin as near to the base of the bill as possible. Remove brains, eyes and any extra meat from the skull. Then take fairly fine table salt, and rub it well into the skull and skin of the head, forcing as much as possible into the skull and about the base of the bill. Turn the skin over the head and salt the neck thoroughly. Make a cut on the underside of the wing, between radius and ulna, removing all the flesh from between these bones and rub the salt thoroughly into this part. Make a slit on the underside of the terminal joint of wing (metacarpel joint) rubbing salt in thoroughly.

If the bird is large such as a Goose, it is best to make an incision on the outside of the bend of the wing in order that salt may get into the metacarpal bones. Draw the tendons from the leg and force salt up into the tarsus. Salt the inside of the skin thoroughly rubbing the salt in, then lay the skin belly up in a box and allow to dry. It is best to sprinkle a little salt over the skins in order that they will form their own pickle and become moist. If in a dry climate the skins should be moistened a little on the inside in order that the salt will melt and form a pickle. If in the tropics where it is very moist and the salt turns to water and runs away, add a little more salt on top of the skins in order that it will renew the salt solution on the skins. The skins can be packed tight in a box after a few days, but it is best to let them have air for a couple

of days until they are thoroughly cured. They may then be packed and shipped.

RELAXING AND MAKING UP OF SALTED SKINS.

The salted skins should be immersed in a bucket of water for an hour or so in order to relax them thoroughly. Then hold the skin over a faucet and allow running water to run through it, in order to wash out all of the salt. Be sure to wash out all of the salt from the plumage. When the skins are relaxed enough to turn inside out take a knife or scraper and scrape off all of the fat. Skins should not be immersed in water long enough to start maceration or the feathers will slip but they may be safely immersed for several hours. When all of the fat is removed from the skin by scraping, immerse it in the following solution:

Gasoline two gallons
Alcohol one pint
Spirits of Turpentine four ounces

The skins may be immersed in this solution for twenty-four hours, then squeezed out carefully with the hands. This squeezing process should be continued for some little time until as much as possible of the grease is removed, then immerse the skin in a fresh solution made as above and rinse out thoroughly. These solutions can be used until they become heavily laden with grease when the old solution is thrown away and the second solution used for soaking the skins. After the skins come from the last rinsing bath put them in a tight box containing hard wood sawdust, maple is the best. Never use oak sawdust as it will stain the feathers. Then shake them carefully from end to end in order to get the sawdust thoroughly into the feathers. If you have a drum that will revolve, such as is used by tanners, so much the better. A shaft may be fastened on each end of a box, the shaft end inserted in a groove, and the box made to revolve by hand. After shaking from end to end for some little time, take out the sawdust and put in fresh sawdust and continue this shaking or revolving process until the feathers are comparatively dry and fluffy, then the skins may be shaken out by hand to remove sawdust and the drying process continued by using a blower. Many of these small blowers are

now on the market, or a vacuum cleaner may be used by hooking the nozzle on the reverse end and putting a cork in the end of the nozzle with a small hole in it, in order to reduce the volume of air current and make it stronger. In other words, making a blower out of the vacuum cleaner. In using the blower, blow the air against the grain of the feathers until they are thoroughly dry and fluffy. The skin should now be in perfect condition for making up, but if after going through this process it is too dry, it may be moistened again by leaving it for an hour or two in a damp box, a tight box with several inches of damp sawdust or sand in the bottom, putting a little moist cotton inside, but it should not be left in long enough to allow the feathers to become wet again. Be sure to poison the skins carefully with arsenic before making them up. Make up in the usual manner, using a stick in the neck to keep the head from breaking off in handling. There will be no further danger of any grease coming out on the feathers or legs if this degreasing process has been carried out properly.

Old dirty and grease-soaked skins may be treated the same as freshly salted skins. Soak in water for a time, so as to partly relax. Remove the stuffing and scrape away any large pieces of fat. Immerse in the gasoline bath for at least twenty-four hours. Very dirty and greasy skins may take two or even three days of soaking in the gasoline bath, but they should be squeezed out several times a day and the bath changed until it is comparatively clean after squeezing. Then dry the feathers in the sawdust box or drum and blow out with the blower. Be sure to poison the skin thoroughly before making up.

Mr. F. W. Wood, one of our Taxidermists, who has made a specialty of remodelling old specimens, has recently degreased and remade, by the above method, the skin of a Whistling Swan, one of the dirtiest skins I ever saw. This Swan was shot on the Columbia River in 1836 by J. K. Townsend. It is now as clean and almost as white as a freshly collected specimen. (Plate XII.)

Academy Natural Sciences,
Philadelphia, Pa.

GENERAL NOTES.

Holboell's Grebe (Colymbus holboelli) in Georgia.—On February 22, 1930, Norman Giles, Jr., reported to me that he had seen what he firmly believed to be a Holboell's Grebe in the lake at the East Lake Country Club in Atlanta. So early the next morning he and I visited the spot and positively identified the bird. It was in winter plumage but seemed to be almost crested and we had a wonderful view of it, preening itself, opening and shutting its bill as if yawning, and although rather nervous it did not appear to be very wild, staying part of the time with some Scaup Ducks. This species is on Wayne's Hypothetical List in 'Birds of South Carolina' and I understand that Dr. Murphey of Augusta procured two specimens on February 13, 1904 and that Mr. Isaac Arnow shot a specimen at St. Marys, Ga. on February 18, 1904. This bird identified here on February 22, and 23 is the only record I can find for this part of the State.—Earle R. Greene, *642 Orme Circle, Atlanta, Ga.*

Simultaneous Loss of Primaries in Prenuptial Molt of Loon.—On April 1, 1930, while investigating the killing of water-fowl by oil from steamers, my attention was drawn to a Loon (*Gavia immer*), which had washed up on the beach at Lambert's Cove, Marthas Vineyard, Massachusetts. The bird had been dead for some time and in addition to being badly oiled was waterlogged and bedraggled. It was evidently passing through the prenuptial molt and many of the feathers of the back and especially the upper wing-coverts were black with white spots. The primary feathers were very short and my first impression was that the bird had probably crawled out upon the beach in order to preen its plumage and remove the oil which had matted down its feathers, and that after the poisons in the crude oil had begun to affect the bird, it had thrashed about on the pebbles and sand and had worn off the ends of its primaries during its death struggles.

Two days later, in company with Mr. Alden H. Hadley of the National Association of Audubon Societies and Mr. Winthrop Packard of the Massachusetts Audubon Society, I inspected several more Loons at Gay Head and Squibnocket on Marthas Vineyard and on April 4, at the Millpond, a small land-locked salt pond at Chatham on Cape Cod, we inspected ten dead Loons in a distance of less than a mile. One of these birds (they had all been dead from a week to a month or more) was in typical winter plumage and showed no signs of a prenuptial molt. This bird was very heavily oiled so that it showed no white feathers below but the feathers of the back were not so badly affected. The old flight feathers were all present. A Red-throated Loon, (*Gavia lumme*) also examined at the Millpond, showed a similar lack of molt and was the only bird of this species examined.

All the other Loons at the Millpond had molted in greater or less degree as was indicated by the presence of black feathers with white spots on the

back and upper wing-coverts, and in every instance the entire set of primaries had apparently been molted simultaneously. In some specimens the new primaries were barely showing beyond their feather sheaths and were nearly concealed by the coverts, in others they showed for an inch or more, but in any one bird the primaries were all of approximately the same length and development.

At one point on the shore of the Millpond two Loons had crawled up on the narrow strip of salt marsh and we were able to capture one of these birds in our hands, through the activity of Mr. Everett Eldredge, Jr., who accompanied us while at Chatham. This bird had an entire set of new and nearly full grown primaries but the quills were not completely hardened and when we tossed the bird into the air it fell heavily into the pond and splashed away for a short distance, using both wings and feet for propulsion. Then it stopped, called briefly and derisively, flapped both wings in the air once or twice, dove, and swam out to join several other Loons which were swimming about in the Millpond. The undeveloped condition of the primaries was plainly evident when it flapped its wings.

It is well known that Loons and Grebes, as well as Ducks and Geese, molt all their primaries at one time in their *postnuptial* molt but the authorities which I have been able to consult, with one exception, make no mention of any such condition in the *prenuptial* molt. The late Edward Howe Forbush, in the first volume of his 'Birds of Massachusetts and other New England States,' describes the molts of the Loon at some length, basing his description largely upon that of Mr. A. C. Bent in his 'Life Histories of Diving Birds.' Mr. Forbush states "the first winter plumage is worn for a year without much modification." The second nuptial plumage begins to appear in November or December "by growth of a few jet-black feathers with white spots on back, wings, rump and flanks; usually this molt is not much in evidence until February; from then on prenuptial molt advances to head and neck and by April or May second nuptial plumage is complete." During the third winter "the prenuptial molt (also complete) may begin in November or later and may not be completed until spring." The parenthesis "(also complete)" was added by Mr. Forbush and his description of the molts is followed by this paragraph,

"*Note.*—As an example of complete spring molt of the Loon, the following is of interest: On March 12, 1921, I picked up at Nantucket a very large and heavy dead Loon apparently in its second winter plumage. There were no signs of breeding plumage except some dark feathers in the upper wing-coverts which were spotted with white. The flight feathers had been molted recently. The primaries were so short that the white under wing-coverts projected beyond their tips; secondaries also were very short. Evidently this bird if alive would have been unable to fly."

Upon my writing Mr. Bent regarding this simultaneous molt of the primaries in spring, he replied "This is certainly a surprising discovery for, so far as I know, none of the water birds have any such complete molt in the spring." At a meeting of the Nuttall Ornithological Club on April 7,

no one knew of this unusual type of spring molt in the Loon. As this note by Mr. Forbush and the condition itself seem to have been pretty generally overlooked, I feel justified in publishing this observation of my own.

Since writing the above I have talked with Mr. George H. Mackay of Boston and Nantucket, whose shooting records for many years have recently been printed by Dr. John C. Phillips. Mr. Mackay immediately recalled a winter Loon with molted primaries which he had collected, in company with the late Sidney Chase, many years ago. Upon referring to his published diaries we found that on February 21, 1892, Mr. Mackay recorded that when shooting on the Western Jetty, at Nantucket, Mr. Chase "shot a Great Northern Diver in the gray plumage today, the wings of which had scarcely any feathers. The bird could not possibly have flown and I took it to be a case of moulting. I have never seen anything similar to it."

While we have been unable to trace the subsequent history of the specimen, the unusual condition of the bird made such an impression on Mr. Mackay that he had no difficulty in recalling the circumstances after an interval of nearly forty years.—JOHN B. MAY, *State House, Boston, Mass.*

Townsend's Oregon Tubinares.—Four South Pacific Tubinares, the Yellow-nosed Albatross, Sooty Albatross, Giant Fulmar, and Slender-billed Fulmar have held their places in the North American 'Check-List' for nearly one hundred years wholly upon their alleged capture off the mouth of the Columbia River by John K. Townsend. The specimens were submitted to Audubon for description and he named two of them as new, along with two others, the Black-footed Albatross and Pacific Fulmar, also secured by Townsend and which occur regularly in the North Pacific. A later alleged sight record of the Giant Fulmar in Monterey Bay Calif., is hardly worthy of serious consideration.

Audubon had one specimen each of the four species under consideration. Of the Yellow-nosed Albatross he says "procured in the Pacific Ocean not far from the mouth of the Columbia River"; of the Sooty Albatross, "procured near the mouth of the Columbia River. Of its habits or distribution I am entirely ignorant"; of the Giant Fulmar, "shot at some distance from the mouth of the Columbia River," and of the Slender-billed Fulmar a note appended by Dr. Townsend states: "Within a day's sail from the mouth of the Columbia River. Its habits are very similar to those of *Procellaria capensis*" etc. and adds "They are easily taken with a hook baited with pork." It should be noted however, that in describing the Pacific Fulmar, a common bird off the Columbia, Audubon says: "Three skins submitted to me by Mr. Townsend appear to belong to two species of the Fulmar genus. The first of these may be named as above [Procellaria pacifica]". Two were of this species and the third he named *tenuirostris* stating that both, along with the Atlantic species were very similar and only differed in the shape and size of their bills. It seems evident that Townsend did not distinguish the two species of the Pacific as different and his note

quoted above quite as likely referred to the Pacific Fulmar and not to the southern form. Furthermore he evidently did not write this note until after he had traversed the South Pacific on his way home since he had no previous opportunity to observe the Pintado Petrel (*P. capensis*) to which he alludes. On his trip from Oregon to Hawaii, December 1834–April 1835, Townsend refers in his 'Narrative' to the birds seen outside the bar of the Columbia and mentions the "brown Albatross" and "numerous Procellariae" and adds to the name of the Albatross "*Diomedea fusca*", but as Audubon did not publish this name until 1839 it was evidently entered later when the 'Narrative' ms. was prepared for publication and the bird he saw there was obviously the Black-footed Albatross. Finally while Townsend includes all the four species under consideration in his "List of Birds Inhabiting the Region of the Rocky Mountains, the Territory of the Oregon, and the North West Coast of America" (Jour. Acad. Nat. Sci., I, read Sept. 10, 1839), he excludes all but *Diomedea fusca* from the list published later in the year in the appendix to his 'Narrative,' evidently changing his mind as to their occurrence there and once more confusing *fusca* with *nigripes*. On his way home around the Horn, in the latter part of 1837, Townsend was taken very ill in Valparaiso, Chile, where he was forced to remain for some two months, while he had spent a month previously collecting on Tahiti.

It will, I think, be evident that Townsend had no clear idea of the identity of the various species of Tubinares nor of where he secured the several specimens; that he sent Audubon no information about the four in question and probably did not label them at all; and that he had every opportunity to secure specimens of all four in the South Pacific, while his serious illness may have made it still more difficult for him to remember which specimens had been obtained at the mouth of the Columbia and which in the south Pacific. The fact that he sent Audubon a specimen of the Chilian Finch (*Brachyspiza*) as from Oregon (described as *Fringilla mortoni* by Audubon) further shows his carelessness or failure of memory. Audubon was in Edinburgh when Townsend arrived home, November 15, 1837, and his published letters show that he, or Edward Harris for him, purchased Townsend's second collection of birds and that they were sent over to Edinburgh. He had no personal intercourse with Townsend until after his great work was completed, if ever.

In view of all these facts it seems far more likely that these four South Pacific birds actually came from the South Pacific and not from the coast of Oregon and that they should be dropped from our North American list or at least placed in the hypothetical section.—Witmer Stone, *Acad. Nat. Sciences, Philadelphia.*

White Pelican (Pelecanus erythrorhynchos) in Georgia.—It has been recently called to my attention by Alexander Sprunt, Jr., of Charleston, S. C. that the following record from Georgia is worth recording in 'The Auk' so I submit it herewith:—On October 3, 1926 I saw the stuffed skin

of a White Pelican, in the residence of D. V. Hembree a taxidermist near Roswell, Ga. This was the property of a Mr. Newberry on Lee Street in West End, Atlanta, who later stated to me that it was taken near Lithonia, DeKalb County, Ga., shortly before the time I saw it and was one of three birds seen near Lithonia, the other two not taken. Possibly the Florida storm at about that time drove them to this section, or maybe they were migrating southward and lost their way. Lithonia is within twenty miles of the center of Atlanta.—EARLE R. GREENE, *642 Orme Circle, Atlanta, Ga.*

Capture of Blue Goose near Richmond, Virginia.—I wish to report the taking of a Blue Goose (*Chen caerulescens*) on the James River a short distance below Richmond. The bird was a male in company with a flock of Canada Geese, and was killed over decoys in a wheat field at Bermuda Hundred, just opposite Hopewell, on February 1, 1930. This region is the famous "Curles Neck" region of the James River, and affords a haven for thousands of Geese during the winter months. So far as I have been able to learn this is the first of this species ever taken in this part of the country. —EDWIN M. HASBROUCK, *Richmond, Va.*

Note on the Roseate Spoonbill in Florida.—Dr. L. M. Bristol of the University of Florida, Gainsville, informs me that there are two specimens of the Spoonbill in the museum there. One is from the Hoyt collection, taken at Micco, Florida in November 1901 and the other from the west coast taken in 1895. Dr. Bristol also states that there are still two rookeries in south Florida.—AMOS W. BUTLER, *Indianapolis, Indiana.*

Killdeer Nesting in Connecticut.—On May 7, 1930, while playing golf at the Woodway Country Club course at Darien, Connecticut, I came on a pair of Killdeer (*Oxyechus vociferus*), with two young birds, apparently three or four days old. The two chicks were running across the fairway, and the parents were simulating a broken wing and trailing around trying to distract our attention in the customary way. In view of the paucity of breeding records of this bird in Connecticut, it seems worth while to record this note.

Until about ten years ago the Killdeer was, in my experience, a very rare bird in the neighborhood of Stamford, Connecticut; but within the last ten years they have become quite common and regular. For a number of years I have seen a good many of them around the fields and golf courses every spring and summer. This is the first time that I have had definite proof of their breeding, although friends have reported to me that they have seen the young birds.

In view of my own observation of the frequency of the adult birds all through the spring, coupled with this definite breeding proof this year, I think that we can fairly say that the Killdeer is now a regular and fairly common summer resident in southern Connecticut.—LOUIS H. PORTER, *Stamford, Conn.*

Sharp-tailed Sandpiper in California.—I have just discovered, in checking over the ornithological collection of the Peabody Museum of Yale University, that we have a skin (No. 1170) of *Pisobia acuminata* (Horsf.), which was taken at Olema, California, Nov. 27, 1870. The collector was A. Provo Kluit, a member of the staff of the Zoological Garden at Rotterdam, Holland, who made a considerable collection in California that year.

In 1872 Professor Othniel C. Marsh purchased over 300 of these bird skins for the Peabody Museum. Kluit did not realize what a rare find he had made, for he identified this Sharp-tailed Sandpiper as a Pectoral Sandpiper. Its label bore the name *Tringa maculata* until about 1925 when Mr. Richard Harrison, engaged in transferring the collections to new cases, detected the error and properly corrected it.

The specimen is a female in first autumn plumage. Fortunately the skin was well made and clearly shows all the diagnostic characters.

Since the earliest North American record of this species hitherto recognized was the female taken by E. W. Nelson at St. Michael, Alaska, September 16, 1877, this bird in the Peabody Museum collection antedates it by seven years.

As stated by A. C. Bent in 'Life Histories of North American Shore Birds' (U. S. Nat. Mus. Bull. 142, p. 169) only four other specimens had been recorded south of Alaska up to March 1927. The last of these was taken by A. W. Anthony near San Diego, California, on September 16, 1921. California may now claim as well the first North American record of this species.—Stanley C. Ball, *Peabody Museum, New Haven, Conn.*

The Broad-winged Hawk in Connecticut in Winter.—As there are so few definite winter records for the Broad-winged Hawk, the record of an immature bird taken in Stamford, Conn., January 12, 1929, may be of interest. The bird has been mounted and is now in the collection of the Stamford High School. It was shot while being mobbed by a flock of Crows, and was not at all shy. As its occurrence in winter is so unusual, I took the specimen to Mr. John T. Nichols of the American Museum of Natural History, who corroborated the identification.—Donald D. Shipley, *Stamford, Conn.*

Pheasants Killing a Quail.—On March 5, 1925, we received a report from the Biological Survey advising that a Bob-white (*Colinus v. virginianus*) No. 283594 was found dead about January 15, 1925, by C. F. Pretler. The bird had just been killed and a Pheasant was feeding on it. This bird, a female, had been banded by us November 5, 1924. We communicated with Mr. Pretler and learned the details of the death of the bird. Mr. Pretler was rabbit hunting on an adjoining property one-half mile from where the bird had been banded. He flushed three Pheasants and found that they were feeding on the body of a freshly killed Bob-white. They had eaten the crop out and were working on the entrails. From tracks in the snow he found that the Pheasants had pursued the unfortunate

Quail for some distance before killing it. The Bob-white appeared to be in good health and showed no signs of previous injury.

At the present time (May, 1930) the Quail are very scarce here. A Pheasant farm has been established a mile away on state land and with it has come a decided increase in the number of Pheasants. We wonder if there can be any relation between the increase in Pheasants and the decrease in Quail.—Leonard W. Wing, *R. 3, Jackson, Michigan.*

Duck Hawk Wintering in Atlanta, Ga.—After several reports of Domestic Pigeons being slain by a Hawk around the Candler Building, the writer offered a small reward to the person who would notify him in time for an accurate observation to be made of the species. Several days later a woman working near the State Capitol Building telephoned to me that the Hawk was on and about the dome of the Capitol; so making a hurried trip there I went out on to the roof in time to see a handsome *Falco peregrinus anatum* fly from one of the ledges of the dome. This was on February 28, 1930, and I also made good observations of the same bird on March 1, 4, and 5. One of its wing feathers seemed to be broken and hung down somewhat. It undoubtedly had many a good meal on the Pigeons of that vicinity as on March 1 feathers were falling from the ledge where it was feeding and the roof of the Capitol had many feathers in certain spots. During the afternoon of March 5 a rather strange thing happened. A Sparrow Hawk lit on the flag pole of the east wing of the building, stayed about a minute and then flew away. Shortly afterward I saw it, uttering squeaky calls, dart several times toward and very close to the Duck Hawk, which was on a ledge of the dome. The Duck Hawk flew away pursued by the Sparrow Hawk for some distance, both getting out of my sight.—Earle R. Greene, *Atlanta, Ga.*

Stomach Contents of Barred Owl.—On September 8, 1929, I obtained a specimen of a Barred Owl (*Strix varia varia*) from Tamworth, N. H. The bird was shot early in the morning as it arose from a rotten log in the woods. An examination of the stomach contents revealed the following: 1 large slug; 7 white-lipped wood snails (*Polygyra albolabris*) with crushed shells; 1 small frog; 1 salamander.—Lawrence Kilham, *Boston, Mass.*

A Lark New to Science from North-Central Kenya Colony.[1]—While studying the variations of the Singing Bush-lark (*Mirafra cantillans*) I found that among the series of that species collected by the late Edgar A. Mearns were three specimens of a distinct, though related, and hitherto unknown, species, all from the Northern Guaso Nyiro River. This new Lark may be known as

Mirafra candida sp. nov.

Type. U. S. Nat. Mus. no. 246221, adult male in molting condition, collected on the Northern Guaso Niyro River, Kenya Colony, August 3, 1912, by Edgar A. Mearns.

[1] Published by permission of the Secretary of the Smithsonian Institution.

Characters: generally similar to *Mirafra cantillans marginata*, with which it occurs, but very much darker rufous; the color of the upperparts of the adult being a deep, rich, somewhat brownish-purple, shade of rufous; not dull earth brown and grayish black as in *marginata*. *M. candida* has no grayish or true blackish markings, the dark centers of the crown feathers being fuscous brown, those of the back feathers deep chocolate brown with lighter margins. When compared with *marginata*, the characters stand out at first glance, *candida* being a rich rufous chocolate bird, *marginata* being a blackish and earth brown one.

The immature plumage of *candida* resembles that of *marginata* but is much more rufous on the remiges, nape, and back.

Measurements of type: wing 80; tail 55.5; culmen from base 13.5; tarsus 20; hind toe without claw 6.5; claw 5.2 mm.

Remarks: *Mirafra candida* is obviously related to *Mirafra cantillans*, although very distinct in color, and were it not for the fact that it occupies the same area as a race of the latter, I would have been inclined to call them conspecific.

The fact that the adult bird is in molt indicates that it had finished breeding. Larks have but one complete annual molt, and as the present specimen is molting the remiges, there can be no doubt that it is in the complete or postnuptial molt.—Herbert Friedmann, *U. S. Nat. Museum, Washington, D. C.*

Interesting Case of Albinism.—An interesting study in albinism was offered by a female Bronzed Grackle (*Quiscalus quiscula aeneus*) which came into the back yard of my Indiana home in company with about forty others December 17, 1912. The flock remained throughout the greater part of the day attracted by the well stocked food and water dishes. Apparently this same flock came almost daily to my yard from December 17 to 31 affording ample opportunity for observation. The head of this "white blackbird" was light gray; the beak yellowish gray; the neck, back, breast and most of the underparts were gray spotted with black; wings pure white, two black primaries in the left wing and one black primary in the right wing; the tail pure white with one black feather in the right center; feet and tarsus dingy dark gray; eyes milky white like those of a roan horse, the right eye being the more staring and conspicuous. The bird might have been blind had not her actions shown her to be gifted with sight. She picked up food bits readily, bathed, preened her feathers and when knocked off the fence by another female, promptly came back and knocked off another Grackle—not the offending bird, however.

Sex was indicated by the actions of the other members of the flock.—Etta S. Wilson, *9077 Clarendon Ave., Detroit, Mich.*

Five Song Sparrows Raised with a Cowbird.—On April 29, 1930, by the Olentangy River west of our home in Columbus, Ohio, I found a nest containing five eggs of the Song Sparrow (*Melospiza melodia melodia*) and one of the Cowbird (*Molothrus ater ater*). None of the eggs had hatched at 5 P. M. May 4, but all had done so the following day. On May 12 between 8:35 and 10:35 the female fed 28 times and the male 21 (the latter

had been banded April 10). This amounted to fewer meals per capita than two other two hour records I have for broods of seven day Song Sparrows, each containing four birds: on July 14, 1929 between 7:47 and 9:47 11 meals were brought by the female and 33 by the male; on May 12, 1930 between 2:50 and 4:50 30 meals were brought by the female and 16 by the male (the male was the same, but the females were different birds).

In the afternoon of this same day I banded and weighed the brood. The Song Sparrows weighed 13.5, 14, 14.2, 14.8 and 16.5 grams respectively; the Cowbird 24.5 grams. The average weight of these Song Sparrows—14.6 grams—compares favorably with that of another brood of four of the same age, namely 15 grams.

At 5 P. M. May 14 the six were in the nest, but all left the next morning at the normal age of ten days. It seemed to me a notable achievement for a pair of Song Sparrows to raise five of their own young plus a Cowbird. The fact that the latter did not hatch earlier than the others deprived it of any initial advantage and undoubtedly contributed to the happy outcome.—MARGARET M. NICE, *Columbus, Ohio.*

Evening Grosbeak in Delaware.—From April 12 until May 5, 1930 I had four Evening Grosbeaks (*Hesperiphona vespertina*) on my lawn, three males and one female. I have studied birds in Delaware for quite a number of years but have never seen this species before. The birds seemed to feed on silver maple and Norway spruce trees. Dr. Witmer Stone tells me that so far as he is aware this constitutes the first record of the bird for the state of Delaware although it has occurred farther south in New Jersey.—ETHEL W. BRADY, *Middletown, Del.*

Lapland Longspur in Somerset County, New Jersey, in April.—On April 5, at Lammington (near Somerville), N. J., I discovered a Lapland Longspur (*Calcarius lapponicus*), among a flock of Horned Larks (*Otocoris alpestris alpestris*), in a plowed field.

As I was watching the Larks with my glasses, while they crept about among the stubble, I noticed a smaller, darker, bird whose manner of *walking*,—as well as the difference in size and color, immediately distinguished it from the Larks. It was a male Lapland Longspur,—and an extremely well marked bird;—I was able to study it within about 8 feet, and saw distinctly the prominent chestnut collar around the back of the neck, the black cheeks and throat, and the light-coloured bill; the greyish-black streaked back, and the white outer-tail feathers and white underparts, streaked on the sides with black. As it flew it uttered a harsh chattering note, strikingly different from the soft call of the Horned Larks.

This field seems to be especially favored, ornithologically;—last year I found Upland Plover, Henslow's Sparrows and Prairie Horned Larks (*Otocoris alpestris praticola*), nesting in the immediate area; and it was while searching for a possible nest of the last named species that I found the Longspur.

With the exception of one specimen taken near Bernardsville, by Mr. William S. Post, about 1890 and a report of its occurrence at Morristown (Thurber), I believe that this is the only other inland record; and the latest date, for the Lapland Longspur in the State.—Cynthia Dryden Kuser, *Bernardsville, N. J.*

Snow Buntings in Colorado.—Thanks to the vigilance of Mr. George J. Bailey of Walden, Colorado the writer is able to report the presence of large numbers of Snow Buntings (*Plectrophenax nivalis nivalis*) about Mr. Bailey's home in North Park and through his courtesy I have been able to examine two of these birds, finding them to be very much streaked females. If my bibliography has not overlooked some obscure publications appertaining to this species, it may be said that this local invasion by the Snowflake during this passing winter (1929–30) is its first unquestionable occurrence in the State for many years, perhaps forty or more. It is possible, even probable, that this species reaches North Park every winter but has passed undetected until now. North Park has an altitude of about 8000 feet, and often shows winter conditions well calculated to invite a visit from this arctic species.—W. H. Bergtold, *Denver, Colo.*

The Blue Grosbeak in Colorado.—Mr. George J. Bailey of Walden, Colorado, reports to me that a female Blue Grosbeak (*Guiraca caerulea*) made a prolonged visit to his home premises last summer. This bird was studied for many days at close range by Mrs. and Mr. Bailey so that there can be little question as to the correctness of the determination. I say this because I have evidence in other ways of their caution in making a sight identification. Waldon places this species a remarkable distance from its usual haunts in southern Colorado, and in an altitude seldom visited by it.—W. H. Bergtold, *Denver, Colorado.*

The Dickcissel (Spiza americana) in South Carolina.—The summer of 1928 witnessed a scattering return of the Dickcissel to the country east of the Allegheny Mountains to nest after an absence of many years. In 'The Auk' for October, 1928 (Vol. XLV, no. 4, pp. 507–509), are records showing the following distribution.

State	Town	Date	Record
Pennsylvania	Darling	May 26, June 9, 18	1 ♂, 1 ♂, 1 pair with food for young
New Jersey	Sharptown	June 10, 11	1 ♂, seemed established.
Maryland	Dickerson	July 15, 22, 29	6 ♂, 3 ♂, 3 ♂, 1 pair with fledgling.
N. Carolina	Raleigh	May 19	1 pair

To these should be added the following:

S. Carolina	Columbia	May 25, 26, 1928	Colony of approximately 50 birds.
S. C.–N. C. (U. S. Route No. 1)	State line	June 5, 1928	1 ♂, singing.
S. Carolina	Columbia	May 18, 1929	1 bird only.

The colony of Dickcissels seen on May 25 and 26, 1928, was located just beyond the out-skirts of Columbia in a young pecan orchard on the Taylor plantation. The orchard occupies a portion of a large and ancient flood plain of the Congaree River and in this favorable situation a cover crop of rye and vetch, planted between the rows of young trees, had made a very luxuriant growth. Here the Indigo Buntings and Goldfinches liked to settle to feed. Here, too, were to be found the brilliant Painted Buntings. In fact this was the only place in the vicinity of Columbia where I found the Nonpareils and in 1927 they were particularly abundant. This plain also seemed to be the favored haunt of the Blue Grosbeaks when near Columbia. And it was here that the Dickcissels established their settlement. One nest containing five pale blue eggs was found about a foot from the ground in its hiding place in the vetch. As there was not much time for making observations on the day of discovery I returned early the following morning and spent about two hours with the colony. The males were singing all about me, having selected the tops of the little pecans as points of vantage. Unlike traveling Bobolinks, the rules of the society apparently permitted only one musician to occupy the top of a tree at a time. The birds were not particularly tame, usually flying when one reached the second or third tree from them. In the morning light as they sat on the tops of the branches with the black patch on the lower throat and the yellowish cast to the ventral feathers they reminded me of rather diminutive Meadowlarks. I fear the colony did not prosper long for a start had been made at turning under the rye-vetch cover crop on the 26th. I had to leave the city a few days later ansd did not see the birds again.

On June 5, 1928, while on the road between Winnsboro and Charlotte, I heard a Dickcissel singing just about a hundred yards over on the South Carolina side of the state boundary line. I have no doubt but that there was a nest in the vicinity. Mr. Arthur T. Wayne, in his 'Birds of South Carolina,' p. 135, quotes Mr. R. Henry Phillips as authority for the statement that the Dickcissel nested near Winnsboro over twenty years ago.

Mr. Bernard H. Stevenson, who had been out to see the colony I had found in 1928, wrote to me the following year that he had been over the plantation on May 18, 1929, and had found only one Dickcissel.—Thomas Smyth, *Indiana, Pa.*

Blue-winged Warbler in Barry County, Mich.—Late in the afternoon of May 9, 1930, a male Blue-winged Warbler (*Vermivora pinus*) was observed south of Hastings in Barry County, Michigan. He was on the edge of a rich swampy woods. When first observed he was preening his feathers in a low bush. He flew to another bush nearby and by the aid of binoculars at a distance of ten or twelve feet all of the markings were distinctly noted.—Lawrence H. Walkinshaw, *Battle Creek, Michigan.*

Maryland Yellow-throat in Pennsylvania in Winter.—In 'The Auk' for April 1930, page 261, Mabel and John A. Gillespie record a Maryland Yellow-throat in winter in Pennsylvania and state that they are not aware

of a previous record for this season. On December 18, 1927 I observed an adult male in Whitemarsh Valley feeding in an old water filled quarry along the half melted edge among a mixture of ice, muck, and decayed leaves.—Lewis MacCuen Smith, *Germantown, Philadelphia, Pa.*

Two North American Migrants on Las Tres Marias.—I can establish the presence of two North American migratory birds on the Tres Marias Islands, during my stay there, from December 26, 1929, to January 12, 1930.

I found a specimen of *Zonotrichia leucophrys gambeli* on the morning of December 28, as I was walking along the east coast of Maria Madre. It was sitting on an almost defoliated Manzanillo-tree, near a lime kiln, and was accompanied by a Zenzontle or Mocking-bird (*Mimus polyglottos*). While the latter immediately left on my approach, the Finch stayed there, and I was able to shoot him. It was a lean juvenile male and its skin is now at the U. S. National Museum at Washington. This finding is important, because it represents the southernmost spot at which this Finch has been taken although its presence had been established for Mazatlán and San Luis Potosí. If this specimen came from the mainland, or from the peninsula of Lower California, is an open question. The place at which it was found points toward the first possibility. Besides this the dominating north winds from November to February are very favorable for a direct south flight (Mazatlán is about 150 km. distant). I was unable to locate any further specimens of this species.

A brown young female of *Circus hudsonicus* was flying about on the same day in front of the cactus covered slope behind the saltworks. The presence on the islands of this bird, which is so prevalent as a winter guest in Mexico and Guatemala, is not very remarkable.

As the Tres Marias Islands are not a very good winter resort for North American migratory birds (it is only during the two passage periods, especially during the spring migration, that a greater number of species visit the islands as already recorded) it could mean, at least in the case of the *Zonotrichia*, that these birds had been driven off their usual course.—Fritz Heilfurth, *City of Mexico.*

Notes from Madison, Wisconsin.—*Micropalama himantopus.* Stilt Sandpiper.—On September 14, 1929, I noticed two Stilt Sandpipers and a Baird's Sandpiper among some shore-birds feeding on a pond near Madison. While deciding which species to collect, a hog dashed into the water and put all the birds to flight. The case appeared hopeless, when an incident occurred that seldom happens in field work. Of all the birds to leave the pond, only the three desired returned. I was able, by careful herding, to drop the three in one shot; however, while in the act of recovering them, a wounded Stilt Sandpiper escaped.

Pisobia bairdi. Baird's Sandpiper.—A male was taken September 14, 1929. (*vide supra*).

Oxyechus vociferus. KILLDEER.—A Killdeer, associated with two Wilson's Snipe, was flushed from a spring December 24, 1929. I am not aware of a previous winter record for the state.

Tyto alba pratincola. BARN OWL.—A female was taken November 24, 1929. Its stomach contained a short-tailed shrew (*Blarina brevicauda*). This specimen was taken at the same place where one was seen August 25, 1917 (Auk, 42 (1925), 131).

Nuttalornis borealis. OLIVE-SIDED FLYCATCHER.—This species is an uncommon migrant. I took a male August 25, 1929.

Otocoris alpestris hoyti. HOYT'S HORNED LARK.—I took a male February 2, 1930, the identification being confirmed by Dr. H. C. Oberholser. At this time, Horned Larks, Snow Buntings, and Lapland Longspurs were present in exceptional numbers.—A. W. SCHORGER, *2021 Kendall Avenue, Madison, Wisc.*

The Shore-bird Flight of 1929 on the New Jersey Coast.—The accompanying compilation of shore-bird records of 1927 field trips made during the southward migration of 1929 along the coast of New Jersey is offered in Table I for comparison with a similar compilation made in 1928 by the writer and reported in 'The Auk,' Vol. XLVI, No. 3, p. 314. The period covered extended from early July to early January, the records being gathered by the writer with the co-operation of members of Linnaean Society of New York and Delaware Valley Ornithological Club. The localities covered were about the same as those visited in 1928. The trips were apportioned as follows: Newark Meadows, 42; Point Pleasant, 11; Barnegat Inlet, 16; Barnegat Marshes (west of Bay), 5; Beach Haven Inlet, 11; Little Island Beach, 1; Grassy Bay, 2; Brigantine and Absecon Marshes, 20; between Atlantic City and Cape May, 8; Cape May, 11.

TABLE I—RANKING OF SHORE-BIRDS ON JERSEY COAST AND SALT MARSH IN 1929. FALL FLIGHT.

(*Figures in ( ) directly following name indicate rank in 1928*)

	Rank 1929	Times seen	Largest No. in 1 day	Total No. all trips
Semipalmated Sandpiper (1)	1	74	4,000	31,040
Semipalmated Plover (4)	2	66	2,000	5,811
Lesser Yellow-legs (3)	3	65	600	3,732
Dowitcher (7)	4	51	600	5,020
Sanderling (2)	5	50	600	3,214
Hudsonian Curlew (11)	6	25	940	3,649
Least Sandpiper (5)	7	60	200	1,780
Killdeer (9)	8	69	100	666
Greater Yellow-legs (8)	9	62	100	499
Knot (13)	10	26	160	776
Red-backed Sandpiper (10)	11	19	300	812
Turnstone (12)	12	33	125	535

	Rank 1929	Times seen	Largest No. in 1 day	Total No. all trips
White-rumped Sandpiper (19)...	13	13	400	425
Black-bellied Plover (6).....	14	46	100	480
Spotted Sandpiper (15).....	15	57	35	386
Pectoral Sandpiper (14).....	16	30	50	267
Western Sandpiper (23).....	17	24	50	118
Piping Plover (18).....	18	24	30	268
Willet (17).....	19	13	36	85
Golden Plover (16).....	20	11	30	81
Upland Plover (20).....	21	16	8	54
Stilt Sandpiper (22).....	22	8	4	14
Purple Sandpiper (25).....	23	1	9	9
Baird's Sandpiper (29).....	24	4	3	6
Marbled Godwit (26).....	25	3	4	6
Solitary Sandpiper (30).....	26	4	2	5
Wilson's Snipe (24).....	27	3	2	5
Northern Phalarope (21).....	28	1	1	1

The summer of 1929 was unusually dry and feeding conditions were not as favorable on Newark Meadows or on Brigantine as in 1928 when fresh water shallow ponds on the fill proved a great attraction. In consequence fewer birds preferring fresh water tarried in these sections.

The most striking contrasts with the season of 1928 follow:

Limnodromus griseus griseus. DOWITCHER.—1929 flight very heavy, the species moving up to 4th from 7th place. Total number counted on all trips in 1928 was 1,624 and in 1929 5,020. Heavy flight July 14 with many remaining to feed in favorable localities, chiefly about Brigantine, until August 1.

Calidris canutus. KNOT.—Some increase over 1928. Principal migration July 23 to August 11.

Pisobia fuscicollis. WHITE-RUMPED SANDPIPER.—Heavy flight early in October—400 on Newark Meadows October 6. They were chiefly feeding about the Newark garbage dumps and a number were unable to fly apparently due to poison or disease incident to contaminated food.

Pelidna alpina sakhalina. RED-BACKED SANDPIPER.—Largest numbers seen in early winter. Principal migration started early in October.

Limosa fedoa. MARBLED GODWIT.—Recorded September 15 both on Newark Meadows and Brigantine.

Totanus melanoleucus. GREATER YELLOW-LEGS.—Some decrease from 1928, possibly due to drought. Main flight observed September 18.

Totanus flavipes. LESSER YELLOW-LEGS.—Total number very similar to that of 1928, but principal flight later. The early flight reached its height about July 31 (maximum in one day 300), but there was a heavy migration September 7 to 18 with a maximum of 600 on September 18.

Actitis macularia. SPOTTED SANDPIPER.—Migrating flock observed July 7.

Numenius hudsonicus. HUDSONIAN CURLEW.—Noteworthy increase in numbers recorded. Total number seen in 1928, 605 and in 1929, 3,649. Since few linger to feed, these totals fairly represent the increase in actual numbers seen. Fairly sustained migration down the coast July 7 to July 28 with largest number recorded July 23 (940).

Squatarola squatarola. BLACK-BELLIED PLOVER.—Considerable decrease in number seen. Maximum 100, October 13.

Pluvialis dominica dominica. GOLDEN PLOVER.—Some decrease from 1928. Maximum on Newark Meadows 30, October 6.

Charadrius semipalmatus. SEMIPALMATED PLOVER.—Large increase over 1928—2,343 in 1928 and 5,811 in 1929. Highest number seen August 17—2,000, but a free movement early in the month.

Arenaria interpres morinella. RUDDY TURNSTONE.—Few seen in comparison with the spring.

The fall flight differs markedly from that of the spring in ranking of species. The tabulated results of 21 trips during April and May, 1929 over much the same territory as covered during the fall flight are shown in Table II. Principal localities visited were Newark Meadows, Barnegat, Brigantine and Absecon marshes. There were 20 species recorded. Conspicuous contrasts with the fall flight are the higher ranking of Red-backed Sandpiper, Greater Yellow-legs, Black-bellied Plover and Ruddy Turnstone and the lower ranking of Lesser Yellow-legs and Hudsonian Curlew.

TABLE II—RANKING OF SHORE-BIRDS ON JERSEY COAST AND SALT MARSH IN 1929. SPRING FLIGHT.

	Rank 1929	Times seen	Largest No. in 1 day	Total No. all trips
Semipalmated Sandpiper	1	8	4,000	9,604
Dowitcher	2	8	500	1,090
Greater Yellow-legs	3	18	350	702
Red-backed Sandpiper	4	8	500	1,057
Ruddy Turnstone	5	6	2,000	3,610
Black-bellied Plover	7	6	1,000	2,975
Knot	8	7	500	1,245
Least Sandpiper	9	8	300	472
Killdeer	10	17	6	53
White-rumped Sandpiper	11	7	75	100
Sanderling	12	7	50	190
Spotted Sandpiper	13	13	6	34
Wilson's Snipe	14	7	25	37
Hudsonian Curlew	15	3	60	63
Piping Plover	16	7	6	18
Western Sandpiper	17	5	5	11
Solitary Sandpiper	18	2	4	6
Lesser Yellow-legs	19	2	2	3
Upland Plover	20	1	2	2

In both Table I and Table II the species are ranked by taking an average of (1) their ranking in "number of times seen"; (2) their ranking in "largest number seen in one day" and (3) their ranking in "total number seen on all trips." This method was also used in 1928.—CHARLES A. URNER, *Elizabeth, N. J.*

The Fall Migration of Water Birds and Others at Reading, Pa.—As a rule the changes that are constantly taking place in the neighborhood of cities are inimical to bird-life. It is rare indeed that a single "improvement" such as the building of a dam has such a marked influence on the bird life of a region as to add six new species to the known local avifauna in the course of a single year, as has been the case of the "Maidencreek Dam," near Reading, Pa., opened last spring and commented upon in the July 'Auk.' Many species that were previously regarded as casuals promptly accepted the new conditions and have occurred in numbers exceeding my total experience in this region during the past 14 years.

The promise of the first spring has been fully realized in the first fall migration on and about this lake.

As reported previously, a colony of Savannah Sparrows nested on its shores, and several families of Bobolinks and Upland Plovers raised their families within a few yards of the water-front. Black Ducks were seen in some numbers all through the summer, and a flock of 4 American Egrets put in an appearance on June 23. Seven Little Blue Herons arrived on July 6, and from that time until September 15 both species were present, the Egrets remaining until October 3, as many as 7 of the latter and 20 of the former being present at times.

A short-eared Owl was flushed from the water's edge on July 27.

The fall shore-bird flight started on July 14 with a pair of Semipalmated Sandpipers, followed on the 23rd by three Solitary, three Least, one Pectoral and some Semipalmated Sandpipers.

A flock of twelve Lesser Yellow-legs appeared on July 31 and had increased to 45 by August 3 when 50 Pectoral Sandpipers, hitherto rather rare here, were also seen. With these came the first of the Wilson's Snipe.

On August 9 the first Pintail arrived, and on August 11 the first Mallard, a flock of nine Blue-winged Teal and a Bittern. A thunder shower on the 14th brought a veritable windfall of birds, two Black Terns, 21 Blue-winged Teals, 80 Lesser Yellow-legs, 80 Pectoral Sandpipers, and the first migrant Soras.

On August 18 a Black-bellied Plover and Semipalmated Plover were seen, most of the previously mentioned shore-birds remaining, and on August 27 the first fall Pied-billed Grebe was noted.

There was little change in the bird life until September 8 when a Dowitcher was seen with the Lesser Yellow-legs, and three Black-bellied Plovers arrived.

On the 14th two Black Terns and a Northern Phalarope were there, and on the following day, after a long shower, two Coots, two Green-winged Teal and a Bald Eagle were among those present.

September 19 brought the first Duck Hawk and on the 28th a Florida Gallinule appeared at the head of the lake, remaining nearby until October 1.

A northeaster on September 30 brought a Ring-billed Gull, three Red-backed Sandpipers and a Golden Plover, and two more days of rain launched the largest flight of the season, when on October 3, 30 Pied-billed Grebes, three Black Ducks, two Pintails, one Blue-winged Teal, 25 Baldpates, four Shovellers, a Redhead and a Ruddy Duck, a Bonaparte's Gull, a Ring-billed Gull, a Common Tern, a Least Bittern, 60 Semipalmated Sandpipers, three Least Sandpipers, 50 Red-backed Sandpipers, 30 White-rumped Sandpipers, five Greater Yellow-legs, six Black-bellied Plovers, five Semipalmated Plovers were among the more notable species present. In a sense parasitic on these were a Duck Hawk and a Pigeon Hawk. The latter was seen in the act of plucking a "peep" out of one of the flocks.

October 12 brought a pair of Golden Plovers to the same mud-lump that had been visited by that of October 1, and the 23rd found three in the same spot. By the latter date the Sandpipers had largely disappeared, a couple of Snipe and Pectoral Sandpipers and one Lesser Yellow-legs alone remaining in the marshes at the head of the reservoir.

October 27 brought the next prize in the form of a flock of 10 Gadwalls. To record this rare bird, entirely new to the county list, twice in one year was indeed more than one could reasonably hope for, yet two of this flock remained until November 3, and one was seen on the 28th. On all occasions they were seen under favorable conditions with Zeiss 8x glasses, both at rest and in flight.

A steady rain on the night preceding November 3 brought another windfall of water birds, a Loon, three Horned Grebes, nine Red-breasted Mergansers, six Green-winged Teal, four Canvasbacks, 50 Old Squaws, 10 Ruddies, four Redheads and four White-winged Scoters being on the dam that morning with a goodly number of Black Ducks, some Baldpates and the previously mentioned Gadwalls.

A belated Red-backed Sandpiper was also seen.

Another rain on November 15 brought two Ring-necked Ducks, three Lesser Scaups, and one Goldeneye, and the 17th brought the first Buffleheads.

Such species as the Black Duck, Pintail, Baldpate, Bufflehead, Scaup and Green-winged Teal remained until the first cold wave on November 30 when the dam froze over; a Bonaparte's Gull hovering over a small unfrozen pool on that day being the last of the birds to desert the dam.—Earl L. Poole, *Reading Public Museum, Reading, Pa.*

Notes on Speed of Flight of Certain Water Birds.—From Ponce de Leon Inlet (formerly Mosquito Inlet), on the east coast of Florida, there extends to the north and to the south what is generally considered to be the finest beach in the world. Here the world's record for speed in an automobile was made by the late Major H. O. D. Segrave, when he drove his "Golden Arrow" over a measured mile at 231 miles per hour. This long

stretch of ocean beach provides an unusual opportunity to time the speed of bird flight. Driving a car equipped with a Waltham speedometer, I have on some occasions paced a bird, or a flock of birds, up to a distance of eight miles. To estimate the absolute speed of these birds, correction would of course have to be made for both wind direction and wind velocity. The data given below, however, will indicate certain limits of speed for the species listed. Where more than one observation has been made, the highest speed recorded is given. In no case, where wind is recorded as "ahead," was the estimated velocity in excess of 10 miles per hour.

	Number of birds	Speed in M. P. H.	Wind Direction
Black Skimmer	2	18[1]	Ahead
Gannet	4	25	Ahead
Cormorant	4	20	Ahead
Brown Pelican	4	26[2]	Abeam
Knot	Flock	38	Abeam
Semipalmated Sandpiper	Flock	32	Abeam
Sanderling	1	41[3]	Behind
Willet	1	27	Ahead
Hudsonian Curlew	2	34[4]	Abeam
Semipalmated Plover	Flock	32	Behind
Black-bellied Plover	1	24	Abeam
Ruddy Turnstone	4	27	Ahead

—R. J. Longstreet, *Daytona Beach, Fla.*

Increasing the Power of Field Glasses.—Greater power in the magnification of field glasses is a frequent desirability by persons looking for birds. Many a bird remains unidentified because its distance is too great for the individual field glasses. When two persons are working together, each with different field glasses, they often give up in despair without determining the distant bird, when a little co-operative work would solve the mystery. The definite solution of the problem in a practical way is the use of two pairs of field glasses applied in tandem series. Two pairs of glasses should each be focused on the distant object and then used in tandem. The eye-piece of one field glass is held to the larger objective lens of the other and the object sought is viewed through both glasses. If the object is not then in focus a slight adjustment of the far field glass may correct the focus, or it may be necessary to adjust both pieces. A precaution to be observed is that necessary care be taken not to scratch the large lens by the eye-piece of the distal field glasses. It may be protected by a ring of soft blotting paper, cloth or felt.

[1] Paced for 3 miles. This was a feeding flight.
[2] Paced for 8 miles.
[3] Helping wind estimated at 10 m. p. h.
[4] Paced for 7 miles.

The tandem or double use of field glasses increases the magnification of the object seen. The degree of enlargement of the object seen by the two sets of glasses is equal to the product of the magnification of the separate glasses. Field glasses of x8 coupled with another of x5 will give a magnification of 40. An opera glass which magnifies 3 diameters may be held to field glasses with a power of 5 and yield a total magnification of 15. A field glass may also be added in a similar manner to a marine glass. The use of the double set may prevent bioptical vision as the two fields may not coalesce as they do with a single binocular. Naturally, this union decreases the field and also the illumination, but will be of great help in the identification of distant birds.—HAROLD B. WOOD, M.D., *Harrisburg, Pa.*

RECENT LITERATURE

Journals of Audubon.—Col. John E. Thayer was fortunate enough, in 1913, to obtain two journals of John J. Audubon which had never been printed. Most of the journals of the painter-ornithologist seem to have been destroyed and such of them as have been published have been so edited and "improved" that while presenting the facts they lose the personal touch that original manuscripts always possess. Col. Thayer has generously presented these diaries and some of Audubon's account books to the Museum of Comparative Zoology where they will be safe for all time.

The Club of Odd Volumes, with the kind permission of Dr. Thomas Barbour, Director of the Museum, has published the journals in two beautiful volumes, maintaining the wording, spelling, etc., etc., with scrupulous care, under the editorship of Mr. Howard Corning, so that as we read them we are virtually perusing the original manuscripts.

The first volume[1] covers Audubon's trip down the Ohio and Mississippi from Cincinnati to New Orleans, and residence at the latter place from October 12, 1820 to December 31, 1821. It is fascinating reading and gives us a rather different picture of the man from any that have been published by his biographers. All the details of the trip are set down roughly, with comments on the country, the weather, the people, and constant mention of birds. Turkeys are often referred to as well as Paroquets and Ivory-bills and frequent reference is made to the thousands of Geese and other water fowl. One is rather impressed by the writer's lack of familiarity with some of the birds. He, for instance, shot a Hermit Thrush a species which he says he had never seen before and compares it with the "Golden-crowned Thrush" and the "Tawny Thrush" (Ovenbird and Thrasher), and the Rusty Blackbird he regarded as a rare species. On July 4, 1821 he presents an annotated list of the birds that he had seen and those that he missed about New Orleans. There is a casual mention: "Saw 3 Red Ibises pass over the plantation Yesterday" which constitutes the main reason for including this bird in the North American list, but considering Audubon's lack of knowledge of southern birds at that time, as constantly shown by the diary, these may easily have been Spoonbills.

The volume is so full of interesting notes that it must be read in full to realize its importance.

The second journal[2] covers trips through New England, New York and Canada in search for subscribers to the octavo edition of the 'Birds of

[1] Journal of John James Audubon Made During his Trip to New Orleans in 1820–1821. Edited by Howard Corning. Foreword by Ruthven Deane. Boston. The Club of Odd Volumes. MCMXXIX, pp. i–ix + 1–239. Edition limited to 225 copies. Frontispiece portrait.

[2] Journal of John James Audubon Made while Obtaining Subscriptions to his "Birds of America" 1840–1843. Edited by Howard Corning. Foreword by Francis H. Herrick. Boston. The Club of Odd Volumes. MCMXXIX, pp. i–vii +1–179. Edition limited to 225 copies. Frontispiece sketch of bird.

America' then being published, and purchasers for the remaining copies of the large work. While of great interest historically as throwing additional light upon the financial side of these publications it does not present the enthusiasm of the ornithologist exploring new fields which is characteristic of the earlier diary.

A reproduction of an outline sketch of a bird which was pasted in one of the journals forms a frontispiece to the second volume and an excellent reproduction of the portrait that Audubon painted of himself appears in the first.

Since the appearance of the original volumes, which were limited to an edition of 225 copies, another edition from the same type but with different paper, title page and binding, and lacking the illustrations, has been gotten out in Cambridge[1] for which we are indebted to Dr. Barbour.

There is a foreword to the first volume by Ruthven Deane and to the second by Francis H. Herrick.—W. S.

Allen's 'Book of Bird Life.'—All readers of 'Bird Lore' have profited by the admirable articles that have been appearing in the educational department for the past ten years from the pen of Dr. Arthur A. Allen, Professor of Ornithology in Cornell University, and it will be a matter of general satisfaction to learn that these have been woven into a volume under the above title[2] in which the original illustrations and others mainly from the camera of the author appear.

Dr. Allen's wide experience with living birds admirably fits him for preparing such a volume as he has produced. As he says in his preface: "Nearly everyone has enjoyed some unusual experience with birds which he may have been at a loss to explain," such as the pecking of a Robin on the window, the Killdeer that trails a broken wing, etc., and he continues "it is the purpose of this book not only to explain such behavior but so to equip the reader that all his past experiences with birds will arrange themselves naturally in an orderly way." Dr. Allen has, we think, fully realized his ideal in the work that he has produced and it should find a place on the book shelf of every student of the live bird.

The first part of the work deals with the birds themselves and the second part with methods for studying them. History, Classification, Distribution, Communities, Birds of Fields and Orchards, of Marshes and Shores, Migration, Courtship, Home Life, Adaptation, Coloration and Economics are the chapter headings for the first part and show how thoroughly the field is covered. In the second part we find, Bird Walks, Calendars and Banding, Birds' Nests, Attracting Birds, Observation Blinds, Bird Pho-

[1] Cambridge. The Business Historical Society. The second journal in this printing has an introduction condensed from that in the first volume, which is lacking in the original.

[2] The Book of Bird Life. A Study of Birds in their Native Haunts; with Photographs by the Author. By Arthur A. Allen, Ph.D., Professor of Ornithology at Cornell University; Editor, "School Department, Bird Lore." D. Van Nostrand Company, Inc., 250 Fourth Avenue, New York, pp. i–xix + 1–426. Price $3.50.

tography, Bird Song and Bird Pets. What a contrast to the introduction to Dr. Coues' famous 'Key' in which guns and ammunition, skinning implements and methods take the leading place. Not a change in sentiment, for ornithologists loved birds just as much then as now, but a change in the necessities of the study. We are now in possession of most of the facts to be learned from the dead bird so far as our home fauna is concerned and have advanced beyond that stage to the wide spread study of the live bird which has developed knowledge and methods never dreamed of a generation ago.

Dr. Allen's ability to transmit clearly to others his knowledge of birds through the medium of pen and camera make his book particularly valuable both as a text book and as a reference work in the home.—W. S.

Stuart Baker's 'Synonymy of the Birds of British India.'—It was the intention, in bringing out a second edition of the Birds of British India, to cover the entire subject in five volumes by omitting all synonymy, but even so a sixth volume proved necessary, and now in answer to a general demand a synonymy in two volumes has been added, of which the first volume is before us.[1]

Beginning with the Corvidae it runs through the orders of land birds and the Rails and their allies, presenting a thoroughly up-to-date nomenclature with full references to the names adopted and to the synonyms as well, being thus doubly welcome to the working ornithologist.

The volume is essentially a "check-list" without the ranges and will prove indispensible alike to the student of Indian birds and to the curator of a general ornithological collection.—W. S.

Uchida's 'Photographs of Bird Life in Japan.'—This attractive book[2] consists of fifty-six plates of Japanese birds artistically reproduced from photographs by K. Shimomura under the direction of Dr. Uchida. A short description of the photograph with a brief account of the habits of the bird is printed in Japanese and English with each plate. The flocks of Cranes, the numerous shore-bird pictures and the Heron photographs, are particularly noteworthy.—W. S.

'The Bird Lovers' Anthology.'—Birds have ever been the inspiration of poets and more than one volume of "bird poems" has appeared, of which the present[3] is, we think, one of the best. The poems here presented

[1] The Fauna of British India including Ceylon and Burma. Published under the authority of the Secretary of State for India in Council. Edited by E. C. Stuart Baker. O. B. E., F. Z. S., Etc. Birds—Vol. VII (Second Edition). By E. C. Stuart Baker. London, Taylor and Francis, Red Lion Court, Fleet Street, March, 1930, pp. i–viii + 1–484.

[2] Photographs of Bird-Life in Japan Directed by Dr. Seinosuke Uchida, Photographed by Kenji Shimomura Vol. I, 1930. Sanseido Co. Ltd., Tokyo, Osaka. Price 3.50 Yen.

[3] The Bird-Lovers' Anthology. Compiled by Clinton Scollard and Jessie B. Rittenhouse, Boston and New York. Houghton Mifflin Company. The Riverside Press, Cambridge. 1930, pp. i–xviii + 1–299. Price $2.00.

have been chosen by the authors, Clinton Scollard and Jessie B. Richardson, themselves poets, for their merit as poems and it may be claimed that some with more merit as ornithology have been omitted. As the authors state however, "It has been necessary to make this collection selective rather than inclusive but it is hoped that no notable bird poem will be found lacking." We feel that their attitude and the results of their selection are most satisfactory.

The works of sixty-four poets are included and we note several verses from the pens of the authors. The little volume will be most welcome to lovers both of birds and of verse and the serious minded closet ornithologist will be the better for an occasional perusal of its pages.—W. S.

Bangs on Types of Birds now in the Museum of Comparative Zoology.—One by one the larger museums of the world are publishing lists of the bird types in their collections, the latest being Mr. Bangs' list of those in the Museum of Comparative Zoology.[1] The development of this collection has been astonishing and we learn that from some 40,000 specimens in 1909 it has now reached a total of over 200,000, the number of types and co-types, at first negligible, now totals 1241.

These are listed with full data and references, and frequently with considerable discussion on the status of the species and availability of the name. In every case the present name of the form is given in full and when the name based on the type proves to be a synonym it is marked with a †.

Mr. Bangs contends that when an author has had several specimens before him and fails to designate one of them as the type they all become co-types and no subsequent author has the right to select one of them as *the* type. This view is by no means universally accepted and as he says the late Robert Ridgway has frequently selected a specimen as type of a description published by him long before without type designation and others have done the same, not only to their own species but in the case of those of others.

They are in effect "first revisors" and it may be argued with considerable justice that they have the same right as one has to select a type species for a genus whose author failed to designate one. In both instances such action makes for definiteness and permanency of nomenclature. In publications which cover a large area, inhabited by several races of a species, with no specimens extant, as in the case of Catesby's "Carolina," the "first revisor" procedure seems the most logical, far more so than to select some spot later as the type locality and use specimens from there as types, often overthrowing the careful work of earlier revisors of the group in question.

Mr. Bangs' list will prove of the utmost importance to all systematic ornithologists who constantly wish to know what types are extant and where they may be consulted, while his annotations will often answer just

[1] Types of Birds. Now in the Museum of Comparative Zoology. By Outram Bangs. Bull. Mus. Comp. Zool., LXX, No. 4, March, 1930, pp. 147–426.

the question that has arisen in working out the status of certain forms. He deserves the hearty thanks of his fellow workers. We note that the author adopts the name Linné in preference to Linnaeus in referring to the founder of binomial nomenclature but the latter seems to have been the original family name while the former only appears later when the honorable title of "Carl von Linné" was conferred upon him. The fact that this was dated back "as of" 1757 does not seem to us to demand any consideration in scientific nomenclature since we do not recognize antedated names except from the year in which they actually appeared. Linnaeus was the name used on the title page of the 'Systema' and should, we think, be adopted.—W. S.

Longstreet's 'Bird Study in Florida.'—This handy little volume[1] has been compiled by the president of the Florida Audubon Society as an aid to beginners in bird study in his state and for those who are making their first acquaintance with Florida birds. We feel that he has succeeded admirably in his undertaking.

We have first a popular review of bird study, the classification of birds, field notes on birds of each of the various orders and families, as an aid to identification, and a field key in which the unknown bird may be run down definitely.

There is also a nominal list of the birds of Florida, 241 species, in the order of the new classification of Wetmore and Miller and finally a fully annotated list of the birds of Daytona Beach, Mr. Longstreet's beautiful "home town," on the Halifax River, in which are given dates of occurrence, character of occurrence, and relative abundance.

Visitors to Florida will find this a most convenient and reliable guide to the bird life of the State.

We congratulate the author on a work well conceived and well carried out.—W. S.

Sclater's 'Systema Avium Aethiopicarum.'—Sclater's Check List of African birds is completed in a bulky volume[2] of 618 pages, entirely devoted to the Passeres. The treatment is the same as in the preceding part already noticed in these columns and the nomenclature and ranges seem to have been carefully worked out. The binomial group name is given in heavy type at the head of each group of subspecies as in the 1910 edition of the A. O. U. Check List. In their new edition, however, the A. O. U. Committee has abandoned this practice as they found that it proved more confusing than helpful and the repetition of the specific name in

[1] Bird Study in Florida. By R. J. Longstreet. President of the Florida Audubon Society. Published by the Halifax River Bird Club, Daytona Beach, Florida. 1930, pp. i–xi + 1–183.

[2] Systema Avium Aethiopicarum. Part II, pp. 305–922; January 11, 1930. By William Lutley Sclater, M. A., M. B. O. U. Published and Printed for the British Ornithologists Union by Taylor and Francis, Red Lion Court, Fleet Street, London, E. C. 4. Price 21 Shillings.

each trinomial seems sufficient indication of the relationship of the races. After all, it is the recognizable units that we are listing, and the ranking of them as species or subspecies is in many instances purely a matter of personal opinion.

Mr. Stuart Baker in his new edition of the 'Birds of India' while retaining the binomial heading to each group of races prints it in the same type as the races themselves and gives no range under it, an advance toward the attitude of the American Committee which latter we think must sooner or later be generally adopted in check-lists, as it already has in some.

Mr. Sclater's excellent list gives us 4439 species and subspecies of birds for Africa arranged in 681 genera. We owe him a debt of gratitude for such a helpful work, especially at the present moment when so much effort is being expended in working out the details of the avifauna of the "dark continent" while only those who have been compiling a check list can appreciate what an amount of work such a volume entails.—W. S.

Hachisuka's 'Contributions to the Birds of the Philippines.'—This work, in two parts, is printed in English and forms a special publication of the Ornithological Society of Japan. Part I[1] includes a description of the physical features of the Philippines and the climate, rainfall, and humidity; a history of the ornithology of the islands, with an extensive annotated bibliography; and a discussion of avifaunal distribution. The bibliography of 235 titles occupies sixty-one pages and is a valuable aid to anyone studying Philippine ornithology.

Part II[2] contains a list of species with annotations on those with which the author is better acquainted. Although the activities of the author in the islands is not very clearly set forth, he appears to have made an expedition to Mount Apo in Mindinao, and to have had full access to the collections of the Bureau of Science, during his stay. New forms are described in the genera *Phapitreron*, *Leucotreron*, *Muscadivores*, *Macropygia*, *Streptopelia*, *Kakatoe*, *Tanygnathus*, *Loriculus*, *Penelopides*, *Hemiprocne*, *Callocalia*, *Centropus*, *Chrysocolaptes*, *Dendrobiastes*, *Rhipidura*, *Macronus*, *Cisticola*, *Pardiliparus*, *Callisitta*, and *Alauda*. A new genus *Apoia* (p. 205), is erected for *Zosterops goodfellowi* and a new subfamily Hypocryptodiinae for *Hypocryptodius cinnamomeus* (p. 206).

The work is well printed and forms an important addition to the literature of Philippine ornithology.—W. S.

Collin's Index Ornithologicus.—No. 2 of this pretentious work[3] is before us and is devoted almost entirely to the Sanderling (*Crocethia alba*).

[1] Contributions to the Birds of the Philippines. No. 1. By Masauji Hachisuka. Supplementary Publication No. XIII. The Ornithological Society of Japan. December, 1929, pp. i–x + 1–137 (+ 1–5 in Japanese.)

[2] No. 2, January, 1930. pp. 141–222.

[3] Index Ornithologicus sive Nomenclator Avium tum viventum tum fossilium. By Alb. Collin. Anno I, No. 2. Kotka, Finland, March 10, 1930. pp. 1–2. Price 25 cts., subscription (six numbers) $1.50.

The elaborate plan adopted in part 1 is continued and we have approximately 1,000 references to mention of this bird, but with the exception of the list of illustrations, they are arranged according to the scientific name employed and not according to subject matter. Consequently if one is seeking information on the nest and eggs of the bird, he must waste time in looking up hundreds of references which he finds relate to other details in the bird's history. If the references were arranged according to subject like those in the several 'Auk' indexes the work would be of vastly greater value.—W. S.

Howell's 'Birds of Alabama.'—The edition of this excellent work[1] (see Auk, 1924, p. 489) was exhausted within a short time after its appearance and a second edition has now been prepared. This is simply a reprint but the type is slightly different and consequently the pages, while the same in number, do not exactly correspond. It is noted too, that in the original, while the bibliography was properly so called in the heading on p. 363, it is referred to as a "biography" in the page captions. In the new edition, however, it is termed a "biography" throughout, which is at least consistent though the author we suspect is not responsible.

The appearance of the typography is superior to that of the first edition and the volume will, we are sure, continue to enjoy a wide popularity and serve as an aid to all interested in the bird life of the South.—W. S.

Patch's 'Holiday Meadow.'[2]—This attractively bound nature study book written for children contains chapters each devoted chiefly to the biography of a bird, mammal, insect, spider, or plant. Two of the chapters relate to birds, one treating of Meadowlarks and the other of Snowflakes. The latter is especially interesting as describing a successful method of winter feeding which kept the birds coming to the vicinity of a farmhouse from which many interesting observations on them were made. In substance and style the book seems well fitted for its purpose, the entertainment and instruction of children.—W. L. M.

German Studies on the Food of Hawks and Owls.[3]—In this discussion of the food of twenty-seven European birds of prey, many of them counterparts of American species, the work of a group of six German workers headed by O. Uttendorfer, begun in 1894 is brought up to date. Most of the previous reports upon the progress of these investigations have been published from time to time in the 'Ornithologische Monatsschrift.'

[1] Birds of Alabama. By Arthur H. Howell. Department of Game and Fisheries of Alabama. Second Edition, pp. 1–384, 31 text figures. 1928.

[2] Holiday Meadow. By Edith M. Patch. Decorations by Wilfrid S. Bronson, pp. 1–165, numerous half-tone illustrations. The Macmillan Company, New York, 1930.

[3] Uttendorfer, O. in collaboration with H. Kramer, Sr., Dr. H. Kramer, J. Meissel, W. Petry and D. Wiemann, Studien zur Ernahrung unserer Tagraubvogel und Eulen, Abh. Naturf. Gesell. Gorlitz, v. 31, no. 1, pp. 1–210, pl. 1–40, 1930.

Each species is treated in order, with more or less on the feeding and nesting habits of each. Especially full treatment is given of the European "Sparrow Hawk" (*Accipiter nisus* L.), the Goshawk (*Accipiter gentilis* L.), and of the Falcon (*Falco peregrinus* L.). Like the American Accipiters, the European ones prey mainly upon birds. At 176 nests of *Accipiter nisus* were found pellets containing the remains of 12,987 birds of 112 species—an average of about 73.5 birds per nest—a figure which would mean more had the observation periods of the nests been more uniform. Finches (including *Passer domesticus*), Skylarks (*Alauda arvensis*), and the Thrush (*Turdus musicus*), are among the heaviest losers to this raptor.

The data upon the European representative *Circus cyaneus* L. of our Marsh Hawk are disappointingly meager in view of the present debate upon the value of this species. However, the investigations of the food of this species by several other German authors are reviewed, and lead the present authors to plead for the protection of this species. While birds, including the partridge (*Perdix perdix*) seem to form a constant part of the food of the species, the number of mice and other rodents taken is so large as to throw the balance in favor of *Circus*, in the opinion of the authors. It appears that cannibalism among young in the nest occurs occasionally in this species as well as in *Circus aeruginosus*. In *Circus pygargus* (Montagu's Harrier) is noted the custom of the male giving the prey to the female, which then takes it to the nestlings. *Circus pygargus* and *C. aeruginosus* seem to be even more worthy of protection than does *cyaneus*.

As for the Owls, their food corresponds closely with that of the American representatives of the respective species.

The methods of research are somewhat at variance with those used by the Biological Survey in the preponderant weight which is given to pellet instead of stomach examinations, although a goodly number of the latter are given for some species. Throughout the article are interspersed various notes of interest on the general habits and abundance of the different raptors in the districts of Germany. Not the least attractive feature is a series of plates showing what actually confronts the determiner of the food items of the group.—A. S. Hyde.

Abstract of Proceedings of the Linnaean Society, N. Y.—This pamphlet[1] covering the years 1927–1928 presents the results of the local field work of this active organization.

Besides the paper on birds of Union County, there are reports on the ornithological year 1926 in the New York City region by Ludlow Griscom and another for the year 1927 by Griscom and Warren F. Eaton. Also the reports of the secretary.—W. S.

The Illinois Audubon Bulletin.—The neat little publication of the Illinois Audubon Society for 1930 contains several articles of much interest. Photographing in a vanishing marsh by J. C. Plagge and W. O. Dawson,

[1] Abstract of the Proceedings of the Linnaean Society of New York for the Two Years ending March 27, 1928. Nos. 39 and 40, pp. 1–103. February 10, 1930.

presents several admirable photographs especially one of the Wilson's Snipe. There are also accounts of the nesting of the Starling in the Chicago area and of the visit of Evening Grosbeaks as well as many notes on birds and bird protection. The society has become affiliated with the Chicago Academy of Sciences and will become the section of popular ornithology.—W. S.

Golf Clubs as Bird Sanctuaries.—A recent publication[1] of the National Association of Audubon Societies is devoted to a plea that golf club grounds may be maintained as bird sanctuaries. This is a very happy and practical idea and it has already been put in practice by quite a number of clubs but the present publication will undoubtedly result in almost universal response.

The pamphlet while clearly setting forth the idea and importance of the plan presents in a small space all that one requires to know in carrying out the plan. Bird houses, bird shelters, feeding platforms and trees and shrubs to attract birds, are all considered, and a wealth of attractive illustrations of these devices and of the birds which may be attracted to a sanctuary add greatly to the force of the Society's arguments. Everyone who is connected with a Golf Club or other ground which may be converted into a sanctuary should secure one of these publications and go to work.

Hawks and Owls are listed among the enemies of lesser birds and while it is explained that indiscriminate shooting of supposed bird-enemies is entirely undesirable the warning might be made a little stronger in view of the widespread idea that every Hawk is a menace while many of them are really working with the conservationist and bird protector in killing off the rats and mice.—W. S.

Shorter Papers.

Bailey, H. H.—The Prairie Warbler in South Florida. (*Bull. No. 3. The Bailey Museum of Natural History*, Miami, Florida.)—The south Florida bird is described as *Dendroica discolor collinsi* (p. 1). The publication dated "11-16-1926" was received by 'The Auk,' April 14, 1930. The name of the man after whom the bird is named is not given but the English name Collin's Warbler does not accord with the Latin name "*collinsi*"; which spelling is correct we are unable to determine.

In another Bulletin (No. 4) April 1, 1930, Mr. Bailey separates White Ibises with long bills as *Guara alba longirostris* (p. 1) but indicates no difference in range so that if really different they should be regarded as species. He also proposes to separate some Sandhill Cranes from Michigan as "*Megalornis-c.-woodi*," Bald Eagles from southeastern Florida as "*Haliaeetus-floridana*" and the Red-eyed Vireo of the Alleghanies of Virginia as "*Vireosylva-o-scotti*." In commenting on Blue Jays he differs from Oberholser as to the South Carolinian bird which he finds to agree with the northern form and not with that of Florida. He also insists that Blue Jays migrate.

[1] Golf Clubs as Bird Sanctuaries Published by the National Association of Audubon Societies. 1974 Broadway, N. Y.

Bailey, A. M.—The Upland Plover. (*Natural History*, March–April, 1930.)—Beautifully illustrated with photographs by the author.

Bangs, Outram and Van Tyne, Josselyn.—Descriptions of Five New Indo-Chinese Birds (*Publ. 272, Zool. Series*, Vol. XVIII, No. 1. *Field Museum Nat. Hist.*, April 9, 1930. pp. 3–4.)—*Garrulax erythrocephalus hendeei* (p. 3) Tonkin; *Cursonia crispifrons saxatilis* (p. 3) Tonkin; *Schoeniparus rufogularis kelleyi* (p. 4) Annam; *Alcippornis poiocephala alearis* (p. 40) Tonkin; *Phylloscopus pernotus* (p. 4) Laos.; all collected on the Kelley-Roosevelts Expedition.

Berry, John.—Notes on the Movement of Duck off Tentsmuir, Fife. (*Scottish Naturalist*, No. 181, March–April, 1930.)

Bowen, W. Wedgwood.—The East African Forms of the Barethroated Francolin, *Pternistes cranchii*. (*Proc. Acad. Nat. Sci. Phila.*, 1930, pp. 85–87. April 11, 1930.)—*P. c. itigi* (p. 86) described as new from Itigi, Tanganyika, and six races distinguished.

Bowen, W. Wedgwood.—Two New East African Birds. (*Proc. Acad. Nat. Sci. Phila.*, 1930, pp. 3–7, March 22.)—*Smilorhis leucotis kenyae* (p. 3) Meru, Kenya and *Nyctiperdix decoratus katharinae* (p. 5) Kibrori, Tanganyika. Four races of *N. decoratus* are recognized.

Bowen, W. Wedgwood.—A New Woodpecker from Angola. (*Proc. Acad. Nat. Sci. Phila.*, 1930, pp. 89–90, April 17.)—*Dendropicus fuscescens camacupae* (p. 89), General Machado, Angola.

Chapin, James P.—Geographic Variation in the African Scops Owl. (*Amer. Museum Novitates*, No. 412, March 22, 1930.)—*Otus senegalensis graueri* (p. 4), northwest shore of Lake Tanganyika, is described as new.

Conover, H. B.—A New Species of Francolin from Southern Abyssinia (Proc. Biol. Soc. Washington, Vol. 43, pp. 3–4, March 12, 1930.)—*F. atrifrons* (p. 3).

Conover, H. B.—A New Pigeon from Siam. (*Proc. Biol. Soc. Washington*, Vol. 43, pp. 1–2, March 12, 1930.)—*Ducula badia obscurata* (p. 1), Krat, southeastern Siam.

Criddle, Norman.—Some Natural Factors Governing the Fluctuation of Grouse in Manitoba. (*Canadian Field Naturalist*, XLIV, No. 4, April.)

Despott, G.—Ornithological Notes. (pp. 1–16, with 5 plates, privately printed, Malta, 1930.)—On the occurrence at Malta of *Chettusia gregaria*, *Tadorna casarca*, *Cygnus olor*, *Pterocles arenarius*, and *Pellicanus* [sic] *onocrotalus*, with photographs of the mounted specimens.

Fairbairn, H. W.—Bird Notes from Parry Sound District. (*Canadian Field Naturalist*, XLIV, No. 4, April, 1930.)

Friedmann, Herbert.—The Caudal Molt of Certain Coraciiform, Coliiform, and Piciform Birds. (*Proc. U. S. Nat. Mus.*, Vol. 77, Art. 7, pp. 1–6, 1930.)—A resumé of the published papers on the subject, with original observations added, and suggestions on the importance of further investigations.

Friedmann, Herbert.—The Sociable Weaver Bird of South Africa. (*Natural History*, Vol. XXX, No. 2, 1930, pp. 205–212.)

Friedmann, Herbert.—A Lark New to Science from Southern Ethiopia (*Occas. Papers Boston Soc. Nat. Hist.*, Vol. 5, pp. 257–259, April 4, 1930.)—*Mirafra pulpa* (p. 257), Southern Shoa, Ethiopia.

Friedmann, Herbert.—Explorations of the Rev. David C. Graham in Szechuan, China; Explorations of Dr. Hugh M. Smith in Siam. (*Explorations and Field Work of the Smithsonian Institution in 1929*, pp. 85–98.)

Griscom, Ludlow.—Critical Notes on Central American Birds. (*Proc. New England Zool. Club*, Vol. XII, pp. 1–8, April 3, 1930.)—*Selasphorus platycercus guatemalae* (p. 2), Guatemala; *Trogon elegans australis* (p. 3), Costa Rica; *Pheugopedius maculipectus microsticus* (p. 5), Tamaulipas, Mexico; *P. m. varians* (p. 7), San José, Guatemala; *P. m. petersi* (p. 7), eastern Honduras; and *Chamaethlypis poliocephala ridgwayi* (p. 7), southwestern Costa Rica, are described as new.

Griscom, Ludlow.—Studies from the Dwight Collection of Guatemala Birds. II. (*Amer. Museum Novitates*, No. 414, March 24, 1930.)—*Cercheneis sparveria tropicalis* (p. 1), Antigua, Guatemala; *Morococcyx erythropygus macrourus* (p. 2), Progreso, Guatemala; *Synallaxis erythrothorax pacifica* (p. 3), San Felipe, Guatemala; *Megarhynchus pitangua deserticola* (p. 4), Sacapulas, Guatemala; *Pitangus sulphuratus pallidus* (p. 4), Sacapulas; and *Heleodytes capistratus xerophilus* (p. 7), Progresso; are described as new and there is a review of the Central American forms of *Polioptila*.

Hallman, Roy C.—Notes on the Least Bittern. (*Florida Naturalist*, III, No. 3, April, 1930.)—About St. Augustine, Fla.

Kuroda, Nagamichi.—On classification by the Shape of the Lingual Bulb in Certain Ducks. (*Zool. Magazine*, Vol. 41.)—In Japanese.

Lewis, Harrison F.—Notes on Birds of the Labrador Peninsula in 1929. (*Canadian Field Naturalist*, XLIV, No. 5, May, 1930.)

Merriam, C. Hart.—Biographical Sketch of Charles Sheldon. (Introduction to Sheldon's *'Wilderness of Denali 1930.'*)

Monroe, J. A.—Additions to "Birds of the Lindsay District." (*Canadian Field Naturalist*, XLIV, No. 4, April, 1930.)

Murphy, Robert Cushman.—Birds Collected During the Whitney South Sea Expedition. XI. (*Amer. Mus. Novitates*, No. 419, April 5,

1930.)—This paper is devoted entirely to the Tubinares; *Thalassarche cauta* is separated into three races, *T. c. eremita* (p. 4), Pyramid Rock off Pitt Island, being described as new, while there is discussion of *T. bulleri*, *Puffinus griseus*, *P. tenuirostris*, *P. carneipes*, *P. leucomelas*, *P. gavia*, *P. heinrothi*, *Thyellodroma bulleri* and *Pterodroma leucoptera longirostris*.

Peters, James L.—Two Undescribed Races of *Phaethon aethereus*. (*Occas. Papers Boston Soc. Nat. Hist.*, Vol. 5, pp. 261–262, April 15, 1930.)—*P. a. mesonauta*, Almirante Bay, Panama, and *P. a. limatus* (p. 261), Tower Island, Galapagos.

Rand, A. L.—Notes on the Summer Birds of the Interior of western Nova Scotia. (*Canadian Field Naturalist*, XLIV, No. 4, April, 1930.)

Stenhouse, J. H.—Birds of Parry's Arctic Voyages. In the Royal Scottish Museum. (*Scottish Naturalist*, No. 181, January–February, 1930.)

Stenhouse, J. H.—The Little Auk (*Alle alle polaris* subsp. nov.) of Franz Joseph Land. (*Scottish Naturalist*, No. 182, March–April, 1930.)—A larger bird both in wing length and bill, described on p. 47.

Stewart, Walter.—The Rook in Lanarkshire. (*Scottish Naturalist*, No. 181, January–February, 1930.)—A detailed list of rookeries.

Smith, Wendell, P.—Bird Observations. (*Vermont Bulletin Botanical and Bird Clubs*, No. 14, January, 1930.)—Observations in Vermont in June.

Taverner, P. A.—A Study of the Canadian Races of Rock Ptarmigan (*Lagopus rupestris*). (*Annual Report Nat. Mus. Canada*, 1928.)—A study of all available material shows three recognizable forms—a southern gray one, *L. rupestris rupestris*, a more northern yellowish one *L. r.kelloggae* and the Greenland form *L. r. reinhardi*. The Newfoundland bird, *L. r. welchi*, is regarded as inseparable from *rupestris* while *L. r. dixoni* is apparently synonymized with *kelloggae*.

Urner, Charles A.—Birds of Union County, N. J. (*Abstr. Linn. Soc. N. Y.*, Nos. 39–40.)—An excellent annotated list based on the author's forty year's field experience and data furnished by his associates. There is also a discussion of the region and of the changes in its bird life which have been noted as environmental conditions have been altered.

Van Oort, E. D.—Results of Bird Banding at the Leiden Museum. (*Zool. Mededeelingen s' Rijks Mus. Nat. Hist. Leiden*, XII, 1929.)—A large number of returns described. (In Dutch.)

Wetmore, Alexander.—A New Hummingbird from St. Andrews Island, Caribbean Sea. (*Proc. Biol. Soc. Washington*, Vol. 43, pp. 7–8, March 12, 1930.)—*Anthracothorax violicauda pinchoti* (p. 7).

Ornithological Journals.

Bird-Lore. XXXII, No. 2. March-April, 1930.

Notes on the Gray-throated and other Dominican Hummingbirds. By Paul G. Howes.—With photographs of nests.

The Gayest of the Wrens. By Mabel Gillespie.—An excellent account of the Carolina Wren.

If you Own a Camera. By F. L. Flickinger.—Advice on bird photography with illustrations of the writer's work with an ordinary camera.

Blackbird Songs and Mating Activities in General. By J. T. Nichols.—A discussion of behaviour at the mating time and the importance and possibilities of a study of the subject. The correlation between plumage and specialized display and the balance between display and song are discussed, but the author admits that birds are beings of emotional complexity and that some of their reactions are difficult to observe and not easy to understand.

The colored plate by Sutton represents the Downy and Hairy Woodpeckers with the usual notes on plumage and migration.

Bird-Lore. XXXII, No. 3. May-June, 1930.

Concealment as a Factor in Nest-Building. By H. Z. Kip.

The Upland Plover in Minnesota. By Mrs. Earl Nealon.

Hummingbirds Build on Construction Scaffold. By H. H. Edwards.

A Near Tragedy. By M. A. Common.—A Cowbird examined a nest from which young Yellow Warblers had flown and failed to deposit an egg.

A Summer Colony of the Least Tern. By C. M. Beal.—Photographs of birds on the Sea Isle colony, Cape May Co., N. J.

The colored plate represents the Cowbird from a painting by Allan Brooks.

Dr. A. A. Allen has a paper on the Ruby-throated Hummingbird and A. H. Hadley shows by photographs the damage to our sea birds by the oil menace.

The Condor. XXXII, No. 2. March–April, 1930.

Happenings in a Robin Household. By Joseph Mailliard.

A census of the Pleistocene Birds of Rancho La Brea from Collections of the Los Angeles Museum. By Hildegarde Howard.—Of fifty-four species *Aquila chrysaetos* with 880 individuals and *Parapavo californicus* with 517, far outdistance any of the others, *Polyborus cheriway*, *Gymnogyps californicus*, *Coragyps occidentalis*, and *Haliaetus leucocephalus* being the only other species to reach 150 individuals. It is a curious fact that the birds of prey and gallinaceous birds comprise three-fourths of the whole collection and the Owls more than a third of the remainder.

Philippine Bird Traps. By R. C. McGregor and Leon L. Gardner.—A list of the birds caught for the markets by the natives and their methods of trapping are described in detail.

The Summer Resident Birds of the Boreal and Transition Life Zones of Mount Pinos, California. By A. H. Miller and S. B. Benson.—With an

interesting comparison with the fauna of the other mountain masses of southern California.

Problems of Bird Conservation in California. By Jean M. Linsdale.—While careful investigation shows that no species seems in danger of extermination the following are "low in numbers," need watching, and may need help; Sage-hen, Clapper Rails, Shore-birds, Ducks and Geese, California Condor, birds of prey, and Yellow-billed Magpie. The provision of refuges for the water-fowl and change of attitude toward the birds of prey are considered two most important points.

Further Bird Remains from the Upper San Pedro Pleistocene. By Loye Miller.

There is an important note on the parasitism of the Dwarf Cowbird by J. S. Rowley.

The Condor. XXXII, No. 3. May-June, 1930.

Recession in Weight of Nestling Birds. By J. M. Edson.—This paper won the Mailliard prize of $100, offered for the best paper on western birds submitted to 'The Condor' during 1929. The writer demonstrates that nestling Violet-green Swallows for a time exceed the weight of their parents after which the weight recedes. They also remain in the nest longer than other species observed and it is suggested that the habits of Swallows require a greater development of wing feathers which may account for both peculiarities.

Roads and Birds. By J. M. Robertson.—A further discussion of the effect of man's activities on bird life. The author concludes that mortality of birds due to highway traffic is not as serious as sometimes considered and is mainly restricted to abundant species not in danger of extermination.

Russell W. Hendee. By A. M. Bailey.—A biographical account of the young naturalist who died of fever on the recent Kelley-Roosevelts expedition.

Two Fossil Birds from the Miocene of Nebraska. By Alexander Wetmore.—*Palaealectoris incertus* (p. 152) and *Paractiornis perpusillus* (p. 153), the former a Grouse and the latter an Oystercatcher.

Two New Races of the Loggerhead Shrike from Western North America. By Alden H. Miller.—*L. l. sonoriensis* (p. 155), Chiricahua Mountains, Arizona and *L. l. nevadensis* (p. 156), Lone Pine Creek, Inyo Co., Calif.

In 'Notes from Field and Study' A. J. van Rossem describes *Agelaius phoeniceus costaricensis* (p. 162), from Costa Rica.

The Wilson Bulletin. XLII, No. 1. March, 1930.

The Old Ornithology and the New. By Althea R. Sherman.

The Nesting Wrens of Brooke County, West Virginia. By George M. Sutton.—Illustrated with excellent drawings of the Carolina, House, and Bewick's Wrens.

The Fall Migration of Mourning Doves. By W. B. Taber, Jr.—A study of the records of recovery of banded Doves in the Biological Survey files.

Birds banded in central Illinois and Indiana seem to concentrate at three points, southern Georgia, southern Louisiana, and east-central Texas.

Nesting of the White-winged Junco. By W. H. Over and G. M. Clement.

Habits of the Florida Red-shouldered Hawk. By D. J. Nicholson.

Water Birds in a Dry Land. By W. E. Lewis.—Fifty species attracted to more or less temporary rainwater pools in Oklahoma.

Bird Migration Records in Northwestern Arkansas. By W. J. Baerg.

Bird-Banding. I, No. 2. April, 1930.

Ectoparasites and Bird-Banding. By Harold S. Peters.—An appeal for the collecting of bird lice, mites, ticks, bird-flies, etc., with illustrations of typical examples.

The New Study of Bird Behaviour. By Herbret Friedmann.—A review of Howard's recent work on the subject.

Some Secondary Results of Bird-Banding. By A. O. Stevens.

Do Birds Usually Change Mates for the Second Brood? By Margaret M. Nice.—Thinks that they do not normally do so.

The Oölogist. XLVII, Nos. 2, 3 and 4. February, March and April, 1930.

Nesting of the Ferruginous Roughleg Hawk in northern North Dakota. By Geo. L. Davy. (February).

Some Great Blue Heron Colonies of Western Ohio. By H. F. Price. (March).

The Gull. XII, Nos. 3 and 4. March and April, 1930.

The Speed of Flight in Certain Birds. By D. D. McLean. (March).—Paced with an automobile, Green Heron, thirty-two miles per hour, Cinnamon Teal, thirty-two, Tri-colored Blackbirds, fifty-two, etc.

Bulletin Iowa Ornithologists' Union. Vol. VII. No. 5. March, 1930. (Mimeographed Journal.)

Notes on Iowa birds including some old records by B. O. Wolden.

The Flicker. VI, No. 2. March–April, 1930. (Mimeographed Journal).

Notes on Minnesota birds.

Bulletin of the British Ornithologists' Club. No. CCCXXXIX. March 5, 1930.

Mr. H. Stevens gives a detailed account of the Kelly-Roosevelts Expedition of which he was a member.

Three new forms of birds are named in this issue: *Puffinus lherminieri gunax* (p. 55), New Hebrides, by G. M. Mathews; *Argya caudatus theresae* (p. 55), Baghdad, by R. Meinertzhagen; and *Timelia pileata dictator* (p. 55), southern Annam, by C. Boden Kloss.

Bulletin of the British Ornithologists' Club. No. CCCXL. March 27, 1930.

David Bannerman reviews the races of *Neotis cafra cafra* describing as new, *C. c. jacksoni* (p. 60), Kenya Colony.

G. M. Mathews proposes *Broderipornis* (p. 61) as a new name for *Broderipus* which he regards as preoccupied by *Broderipia*.

Dr. E. Stresemann describes *Ninox novaeseelandiae remigialis* (p. 61) Kei Islands.

Bulletin of the British Ornithologists' Club. CCC XLI. May 7, 1930.

V. C. Wynne Edwards describes local distribution of birds in Devon, England, especially Buzzards and Herons.

Messrs. Chases and Kloss propose *Briania* (p. 69), for *Nitidula* preoccupied, and the latter describes *Chalcoparia singalensis assamensis* (p. 70), Cachar; and H. Whistler, *Cyornis tricolor notatus* (p. 70), Kashmir; and *Acrocephalus concinens hokrae* (p. 71), both from Kashmir.

British Birds. XXIII, No. 10. March 1, 1930.

British Birds Marking Scheme. Report for 1929. By H. F. Witherby. Over 25,000 birds banded last year making a total of 258,791 in twenty years time. A complete list of species for 1929 with number banded and number of returns is presented. Other returns listed in April issue.

Birds of Inner London. By A. H. Macpherson.—Additional species given.

The Food of Certain Birds of Prey. By R. H. Brown.—Take their toll of smaller birds without affecting the abundance of the latter.

British Birds. XXIII, No. 11. April 1, 1930.

Ornithological Report for Norfolk, 1929. By B. B. Riviere.

Bird Trapping in a Suburban Garden. By D. L. Collenette.

British Birds. XXIII, No. 12, May 1, 1930.

On the Winter Distribution of Some Sea-birds. By R. O. Blyth.—On a voyage to and from South Africa.

The Migrations of the Bar-tailed Godwit as Observed on the Lancashire Coast. By F. W. Holder and R. Wagstaff.

Supplementary Report on the Census of Heronries. By E. M. Nicholson.

The Ibis. (12th Series) VI, No. 2. April, 1930.

Seven Weeks in Eastern and Northern Iceland. By W. M. Congreve and S. W. P. Freme.

On the Age of Some Races of Birds. By R. E. Moreau.—Argues from several lines that two races of Egyptian birds have developed within the last 10,000 years and two others within 5,000 years and that no races of Passerine birds have developed in Mesopotamia in that time.

The Shell-smashing Habit of Gulls. By C. Oldham.—Discussion as to whether this well known habit is "instinctive and heritable or acquired."

Seventh report of the Committee on Nomenclature etc., of British Birds. —*Chordeiles virginianus* becomes *C. minor*; the Crane returns to the name

of *Grus*, and the much named Lesser Black-backed Gull now becomes *Larus fuscus graellsii*. All of these changes have been adopted by the A. O. U. Committee, two of them having been proposed by its members. Happily both Committees are in accord on these cases at least.

Birds of the Rewal Pindi District, N. W. India. By H. Whistler. Part II.

Field Notes on Greenland Birds. By E. M. Nicholson.

Some Remarks on Mr. Hachisuka's so-called *Phasianus colchicus* mut. *tenebrosus*. By P. R. Lowe.—*P. colchicus* was the original British stock and bred true for a thousand years. Then *torquatus* came in and hybridism appeared, *versicolor* also figured and gave rise to the so-called Green Pheasant which curiously enough has recently increased greatly in numbers for some reason not yet explained. *P. colchicus* in pure strain is now one of the rarest birds to be found in Great Britain.

The Emu. XXIX, Part 4. April, 1930.

Observations on Cassowaries with Description of a New Subspecies. By A. S. LeSouef.—*Casuarius uniappendiculatus multicolor* (p. 242), Mandated Territory, New Guinea.

The Australian Gulls. By G. M. Mathews.—Extracts from Dwight's 'Gulls of the World.'

Notes on the Camp-Out at Salt Creek, The Coorog, S. A. By E. S. Hanks.—An annotated list.

Bird Protection in South Australia. By J. Neil McGilp.

A Bird Diary from Sydney to Antwerp. By J. S. C. Elkington.

Nests and Eggs of New Zealand Birds. By G. M. Mathews.—A valuable compilation stating the general character of the nest and its situation and description of color and size of eggs with dates of the nesting season.

Bird Notes of a Recent Trip to Wilson's Promontory, Victoria. By C. Bryant.

Numerous short notes on various Australian birds and a number of excellent photographs.

The South Australian Ornithologist. X, Part 5. January, 1930.

Notes on the Birds of Central Australia. By J. B. Clelend.

Many other short papers on South Australian birds.

The South Australian Ornithologist. X, Part 6. April, 1930.

Swallows and Martins. Two articles. By J. Neil McGilp and J. W. Mellor.—Popular accounts of the Australian species and their nesting.

The Bateleur. II, No. I. January, 1930.

The Eggs of the African Limicolae in the Stoneham Museum. By H. F. Stoneham.—Full descriptions and measurements.

A New Scrub Chat from Uhehe, Tanganyika Territory. By H. Grote.—*Erythropygia leucoptera sclateri* (p. 14).

Storks in South Africa. By Austin Roberts.

African Bird Names in Dho-Luo.—Names of 89 species with pronunciation of vowels.

Some new Species and Forms recently added to the African List.

Arrival Dates of Palearctic Migrants in Africa.

Alauda. II, No. 1. February 25, 1930. [In French.]

Geographic Variation in *Certhia brachydactyla* in western Europe. By H. Jouard.—*C. b. bureaui* (p. 41), Brittany, and *C. b. parisi* (p. 47) Eastern Pyrenees, are described as new.

The Vision of Birds. By Dr. Rochon-Duvigneaud (continued).

Bird Hunting by the Eskimos in Eastern Greenland. By P. Remy.

Alauda. II, No. 2. April 20, 1930. [In French.]

Remarks on *Parus atricapillus* from Valais, Switzerland. By O. Meylan.

Woodpeckers, Nuthatches etc., and their food. By P. Madon.

Louis Bosc, A Forgotten Ornithologist. By C. E. Hellmayr.—Among his publications is the description of *Corvus coerulescens* from Florida which is the Florida Jay and is an earlier name than *cyaneus* Vieillot, so that this bird will now be known as *Aphelocoma coerulescens* (Bosc.).

L'Oiseau. XI, No. 1. January, 1930. [In French.]

A Systematic Revision of the Genus *Garrulax*. By J. Berlioz (continued in Nos. 2 and 3).

Observations on a *Microglossus*. By Guy de Germiny.

The Partridges are discussed by Messrs. Seth Smith and Delacour (continued in No. 3).

L'Oiseau. XI, No. 2. February, 1930. [In French.]

Notes from Madagascar. By J. Delacour (continued in No. 3).

Notes on Aviculture.

Journal für Ornithologie. LXXVIII, No. 2. April, 1930. [In German.]

Studies of the Density of Bird Population in the Breeding Season. By G. Schiermann.

Birds of Djampea and Adjacent Islands. By W. Meise (continued).—*Treron pompadora ada* (p. 186) Madu; *Ptilinopus melanocephalus margaretha* (p. 186) Kalao; *Macropygia magna longa* (p. 188) Kaloa; are described as new.

Serum Diagnosis in Ornithology. By A. Erhardt.

Maturity and Plumage Perfection in Birds. By J. Verwey.

Pictures of the Life of a Pair of Sparrow Hawks at Breeding Time. By H. Siewert.—Excellent photographs.

Journal für Ornithologie. LXXVIII, Sonderheft. 1930. [In German.]

An account of the Expedition of King Ferdinand of Bulgaria to Lake Victoria Nyanza and the High Mountains of Equatorial Africa, with an account of the ornithological collection by Hans von Boetticher.

Ornithologische Monatsberichte. 38, No. 2. March, 1930. [In German.]

The Terrible Effect of the Hard Winter of 1928–29 on Bird Life. By E. Stresemann.

New Bird Races from Kwangsi. By E. Stresemann.—*Throchalopteron milnei sinianum* (p. 47), *Cuculus canorus fallax* (p. 47) and *Butorides striatus connectens* (p. 48).

Ornithologische Monatsberichte. 38, No. 3. May, 1930. [In German.]

On *Erythrina pulcherrima* and *E. eos* sp. nov. By E. Stresemann.—Five races of the former recognized and the latter described from Sungpan. *Hirundo smithii bobrinskoii* (p. 76), is described from Buchara by W. Stachanow.

Der Vogelzug. I, No. 2. April, 1930. [In German.]

Numerous notes on bird banding especially with regard to Crossbills, Rooks, and Blackbirds (*Turdus merula merula*). The movements of the last are discussed at length with many return records.

Beiträge zur Fortpflanzungsbiologie der Vogel. VI, No. 2. March, 1930. [In German.]

Nesting habits of the Warblers, *Locustella fluviatilis* and *L. luscinioides;* the Godwit (*Limosa limosa*); Stork (*Ciconia ciconia*); and Rook (*Corvus frugilegus*) by various authors.

An Oölogical Investigation of the Eggs of some Waterfowl. By M. H. Harms (continued in May issue).

Nest Building in Owls. By L. Schuster.

Beiträge zur Fortpflanzungsbiologie der Vogel. VI, No. 3. May, 1930. [In German.]

Parasitism in Weaverbirds. By C. F. Belcher.

Many notes on breeding habits of birds of Germany.

Der Ornithologische Beobachter. XXVII, Nos. 5, 6 and 7. February, March and April, 1930. [In German.]

Nesting of the Black-throated Grebe (*Podiceps nigricollis*) in the Untersee (Germany). By H. Noll-Tobler.—With excellent photographs. (February.)

Observations on a Trip to Lofoten, Norway and through Swedish Lappland. By Julie Schinz.—Illustrated; with lists of species seen in the two regions. (March.)

Bird Life of the Camargue. By M. Gasser. (April.)

Orgaan der Club van Nederlandsche Vogelkundigen. II, No. 2-3. December, 1929. [In Dutch.]

Contribution to Our Knowledge of the Avifauna of Schokland. By F. H. vanden Brink and C. G. B. TenKate.—With excellent photographs of

the island which lies in the Zuyder Zee, Holland, and a list of the birds observed.

Tori. VI, No. 28. December, 1929. [In Japanese and English.]

On the Birds of the Kurile Islands II. By Y. Yamashima.

Contributions to Variations Among Birds. By M. Hachisuka. [In English.]

Birds Observed during the Voyage from Naples to Kobe, 1928. By N. Kuroda. [In English.]

Birds Observed and Collected during a Voyage between Kobe and Singapore and Java, 1929. By N. Kuroda. [In English.]

A List of Bird Skins Obtained in South China. By N. Kuroda. [In English.]—*Dryobates major renschi* (p. 61) Chihii is described.

Ornis Fennica. VI, No. 4 and VII, No. 1. [In Finnish.]

Numerous lists and notes on birds of Finland and Lappland.

An Albino Flycatcher (*Muscicapa striata*) is described (No. 4) and there is a biographical sketch of Prof. K. E. Kivivikko (No. 1).

Danske-Fugle. XI, No. 1–2. 1930. [In Danish.]

Entirely devoted to lists of returns from banding.

El Hornero. IV, No. 3. December, 1929. [In Spanish.]

The Tucans of the Argentine Republic. By R. Dabbene.—With a colored plate.

Notes on the Birds of Northeastern Argentina. By L. Dinelli.

A biographical Sketch of Hudson. By J. Casares.

The Pigeons of Argentine. By W. H. Hudson translated and annotated by A. Steullet and E. Deautier.

A curious Nest of the Hornero (*Furnarius rufus*). By J. Tremoleras.

Geographic Distribution of the Forms of *Troglodytes musculus* in Argentina. By E. A. Deautier.

Birds in the Folklore of South America. By R. Lehmann-Nitsche (continued).

Uragus,[1] Vol. X, No. 2, 1929. [In Russian].

On the 100th anniversary of the birthday of Alfred Brehm. By Hermann Johansen.

On the 10th anniversary of the death of Prof. J. A. Palmen. By Hermann Johansen.

On the Avifauna of northwest and western Altai. By P. M. Zalessky.

On the Avifauna of the Minussinsk Region. By W. W. Gubar.

A Chlorochroistic Siberian Starling. By W. F. Krassowski.

Destruction of Water Birds on the Baraba Steppe. By I. A. Dolguschin.

[1] Review contributed by T. S. Palmer.

Avicultural Magazines.

Aviculture. II, No. 3. March, 1930.

There is an article on the Crowned Wood Partridge (*Rollulus roulroul*) by Lee S. Crandall with an excellent color plate from a painting by Roland Green, and numerous notes on aviculture and on the habits of various birds in captivity.

Aviculture. II, No. 4. April, 1930.

Breeding White-eared Turacous. By A. H. Isenberg.—With illustrations of Mr. Isenberg's aviaries at Menlo Park, California and of other aviaries and sanctuaries.

The Avicultural Magazine. VIII, No. 3. March, 1930.

A colored plate of the Raja Lory (*Chalcopsitta insignis*) from a painting by Roland Green.

Notes on the Quetzal, American Quail, and Francolins.

Notes on Partridges and Grouse and the breeding of the Sarus Crane. Also notes on various British aviaries.

OBITUARIES.

ONCE more it is our sad duty to record the passing of a Fellow of the American Ornithologists' Union with the death on May 5, 1930, of Arthur Trezevant Wayne, at his home at Mount Pleasant, South Carolina.

Readers of 'The Auk' have long been familiar with the name of Arthur T. Wayne, as there has been scarcely a volume of the journal in the past forty-five years that did not contain some contribution from his pen on the bird life of his native state and usually of the immediate vicinity of his home, where he was almost continually "in the field." His 'Birds of South Carolina' moreover has been our standard work upon the ornithology of this part of the South.

Hosts of readers have been impressed with the thoroughness of Wayne's intensive study of the bird life of his home acres, but only those whose privilege it has been to visit him and hear from his own lips the story of his collection, can fully realize the perseverance and care with which he pursued the search for bird-lore which became his life work, or can appreciate the wonderful memory which retained to the last every detail regarding the birds he had secured.

Isolated as he was from kindred spirits for the major part of his life, and remote from the great scientific centers, he nevertheless acquired a knowledge of local ornithology equalled by few, even of those who were able to enjoy the facilities of great museums and libraries. In the making of specimens he developed a skill equal to that of the best preparateurs, while his enthusiasm for the study of bird life was as unique as it was contagious. It seems peculiarly fitting that the end of his labors should have come in the midst of his collections while showing some specimens to visiting friends.

Most eminent of the ornithologists of the South the passing of Arthur Wayne will leave a gap in our ranks that will not soon be filled.

The President of the A. O. U. has appointed Mr. Alexander Sprunt, Jr. to prepare a memorial address to be read at the next meeting of the Union.—W. S.

HERMANN VON IHERING, elected as a Corresponding Fellow of the American Ornithologists' Union in 1902 and an Honorary Fellow in 1911, died at Büdingen, Upper Hesse, Germany, Feb. 24, 1930. He was the eldest son of Prof. Rudolph von Ihering, an eminent jurist and professor of Göttingen University, and was born at Kiel, Germany, October 9, 1850. He received his education at the Gymnasium and the Universities of Giessen, Leipzig and Berlin. At the age of 18 he went to Vienna where his father had accepted a call, and upon the outbreak of the war of 1870 he enlisted in Darmstadt in the 117th Regiment of Musketeers and served as an 'Unterarzt' in the Lazarette. After passing his medical examinations in

Berlin and Göttingen he took up zoology and geology and received the degree of Ph.D. in 1876. After serving some years as assistant in the zoological institute in Göttingen he located in Erlangen in 1876 and Leipzig in 1878 as privat dozent in zoology.

In 1880 he went to Brazil which became his home for the next 30 years, and located in Rio Grande do Sul in a German colony east of São Leopoldo. Here he collected birds for the British Museum and for Count Hans von Berlepsch, eggs for Nehrkorn, and spiders for Count von Keyserling. He practiced for a year as a physician and served as editor of a German paper at Port Alegre, and in 1883 was appointed a traveling naturalist of the National Museum in Rio Janeiro, with station in Rio Grande do Sul. Three years later he located on Doktorinsel in the delta of the Camaquam River in Logoa dos Patos where he erected a spacious home which is described in his unpublished memoirs 'Lebenserinnerungen.'

In 1893 Dr. von Ihering became Director of the State Museum of São Paulo, a position which he held for 23 years. There he built up a Museum and Botanical Garden which made his fame world wide and provided for the publication of their scientific papers in the 'Revista do Museu Paulista.' In 1916 on account of the entrance of Brazil into the World War he was compelled to resign his position, but four years later took charge of the Museum at Florianopolis in the State of Santa Catharina. After four years' service in this post he resigned to return to Germany where he spent his remaining days at Büdingen and was made Honorary Professor of Paleontology at the University of Göttingen.

In recognition of his work von Ihering received many honors. When he celebrated his 70th birthday in 1920 he was an Honorary or Corresponding Member of 30 academies and learned societies, and his name was borne by five genera and more than 100 species of animals and plants. On the occasion of the Golden Jubilee of his Doctorate of Philosophy the Deutsche Wissenschaftliche Verein in Buenos Aires published his biography with a portrait and bibliography of his works, containing 310 titles on various subjects ('Phoenix,' XIII, pp. 7–60, 1927). Of these about 20 relate to birds and include several important contributions, among which may be mentioned his first paper, published with von Berlepsch in 1885, on the birds of the region of Taquara and several later ones on the birds of the State of São Paulo of which he had observed 695 species and subspecies. One of his last contributions on birds, 'The Classification of the Family Dendrocolaptidae,' appeared in 'The Auk' for 1915, pp. 145–153.—T. S. P.

Professor Stephen Alfred Forbes died in Urbana, Illinois, last March, aged 86 years (May 29, 1844–March 13, 1930). While he is recognized as a founder of the science of Economic Ornithology, and in 1883 was elected an Active Member (equivalent of present Fellow) of the American Ornithologists' Union, he evidently regarded himself primarily as an entomologist. He resigned in 1892, but many years later, in 1926, the Union elected him a Corresponding Fellow.

The ornithological work of Professor Forbes was chiefly performed in the seventies and early eighties. It began as part of the effort to amass a general zoological collection for the State Natural History Society at Normal, Illinois. In 1877 the museum so built up became by legislative act the State Laboratory of Natural History, with Professor Forbes as director. In 1882 he became State Entomologist, and in 1884 Professor of Zoology and Entomology at the University of Illinois, where the collections were moved.

All of his predecessors in the office of State Entomologist of Illinois, Le Baron, Walsh, and Thomas, had paid some attention to the economic value of birds, and it was natural on this account as well as from the content of the subject that he should work along this line. He carried the work further than the others, however, and among the collections he brought together was one of more than 5,000 stomachs of birds. This was later transferred to the U. S. Biological Survey.

Assisted by Harrison Garman, Professor Forbes worked, sometimes with a good deal of discomfort in cold weather, in a laboratory over the Museum at the State Normal University. Professor Garman says: "As I recall him at this time, he was a spare, square-shouldered man with black hair and mustache who stood at a tall work table looking through a tall binocular Beck microscope, of a type that has gone the way of the long rifle of the pioneer. . . At the outset we worked at everything that came our way, from field work collecting birds, fishes, and insects to the indoor tasks of determining our collections and even indexing the growing library. . . During the first years of the period of which I write he did not spare himself either as administrator or research worker, and I am of the opinion that his best scientific work was done during this time."

The writer is inclined to agree with Professor Garman in this appraisal of Forbes' early work. His papers on the food of birds established the methods that are used by the best workers in economic ornithology today, and his essays "On some Interactions of Organism" and "The Regulative Action of Birds upon Insect Oscillations" laid a philosophical basis for the science that has stood the test of time.

In a series of seven papers on the food of birds published between 1880 and 1883, Professor Forbes founded the modern science of economic ornithology. He performed services equally as valuable to the study of the food habits of beetles and fishes, but not the same advantage has been taken of his pioneering in these fields as in that of birds. Thirty to thirty-five years later Professor Forbes published a few papers on the bird population of Illinois based largely upon field work by A. O. Gross and H. A. Ray, completing his contributions to ornithology.

Biographical sketches of Forbes may be found in 'Science,' 71, pp. 378–381, April 11, 1930, and in 'Entomological News,' 41, No. 5, May, 1930, pp. 175–178, and a bibliography of his earlier publications on economic ornithology in "Birds in their Relations to Man," by C. M. Weed and Ned Dearborn, 3rd ed., 1924, pp. 363–365.—W. L. M.

CARL FRIEDRICH WILHELM KRUKENBERG, elected a Corresponding Member of the Union in 1884, died at Gera, Reuss, Germany, Feb. 18, 1889. He was born in Königslutter, Brunswick, Germany, May 27, 1852, and at the time of his death, in his 37th year, was Professor of Physiology in the University of Jena. No notice of his work having ever appeared in 'The Auk,' it seems desirable even at this late date to recall briefly his activities and the circumstances leading to his election to the Union.

Krukenberg was primarily a physiological chemist although his first notable contribution which appeared in 1877 was entitled 'Mikrographie der Glasbasalte von Hawaii.' Among the subjects in which he was especially interested was that of pigments. Prior to his election to the Union he had published two contributions on pigments in feathers and one on the colors of eggs. The two former 'Die Farbstoffe der Federn,' forming parts of his 'Vergleichend-physiol. Studien,' were reviewed in the 'Bulletin of the Nuttall Ornithological Club' for 1882, where attention was called especially to the comments on turacin and turacoverdin. 'Die Farbstoffe der Vogeleierschalen' was published in 1883, and one of his latest and most comprehensive works 'Vergleichend-physiologische Vorträge,' a book of 517 pages, appeared in 1886. Lists of his other publications may be found in 'Leopoldina,' Vol. XXV, p. 55, 1889, in the 'Royal Society's Catalogue of Scientific Papers' and in the 'Catalogue of the Library of the Surgeon General's Office, U. S. Army.'—T. S. P.

FRANCIS COTTLE WILLARD, an Associate of the American Ornithologists' Union, since 1909, died suddenly at his place of business in Farmingdale, Long Island, N. Y., Feb. 21, 1930, as the result of a heart attack. He was born in Leipzig, Germany, on April 30, 1874, while his parents were travelling abroad. He was the son of Mary Wolcott and the late Thomas Rigney Willard, of Galesburg, Illinois, where his early life was spent. For many years his father had been professor of Greek and German in Knox College, Galesburg, Illinois, later serving as acting president and dean, and here it was in an environment of culture and ideal home surroundings that Frank grew to young manhood. He was graduated from Knox with the class of 1896, having distinguished himself as a student and athlete, and was a member of Phi Gamma Delta fraternity. Soon after graduation he went to Tombstone, Arizona, where he worked in his uncle's general store and taught in the little village school. He came east in 1916 and entered the sand and gravel business, in partnership with another uncle, in Farmingdale, Long Island. He was still the active manager of this business, The Willard Sand & Gravel Company, at the time of his death. On November 15, 1923, he married Beatrice Biddle. They were blessed with three children, Mary Claire, Beatrice Biddle and Nicholas Biddle Willard. Mrs. Willard and the three young children survive him.

They made their home in Smithtown Branch, Long Island, where he became a highly respected and much beloved citizen, and a Vestryman in the local Protestant Episcopal Church. He was a devoted husband and

father, was always ready to give a helping hand wherever needed and would always do more than his share to help better the community.

His interest in birds began in boyhood, when he started collecting eggs near Galesburg, Illinois. He was best known to the egg collecting fraternity, as Frank Willard, of Arizona fame. During the twenty years that he lived in Tombstone, he acquired a vast fund of knowledge of Arizona birds and amassed a splendid collection of beautifully prepared eggs. He exchanged extensively with many of the best egg collectors and established a fine reputation for careful thorough and reliable field work. When he moved east his collection was sold to a California oologist. Since then he has started and built up quite a large new collection, which is still in the possession of his family. His ornithological writings consist of a number of short papers published in 'The Auk' 'The Oologist' and 'The Condor' mainly on the nesting habits of Arizona birds. Among the species which he dealt with in some detail in these papers are the Flammulated Screech Owl, White-necked Raven, Western Evening Grosbeak, Rivoli and Blue-throated Hummingbirds, and Olive Warbler. Practically all his articles were illustrated with photographs from life of the nests and eggs of the species treated.

My acquaintance with Frank Willard began by correspondence with him, while he lived in Arizona. He called at my house soon after he came east. We made a number of short collecting trips together and our acquaintance soon developed into a warm and lasting friendship. But it was not until I spent two months with him in Arizona in 1922 that I really learned to know the man, his sterling worth and his ability as a field ornithologist. Endowed with a splendid physique, prodigious strength and remarkable agility, skill and resourcefulness, he was, without exception, the most efficient man in the field of all the many with whom I have had collecting experience. He was the best climber I have ever seen, absolutely fearless, full of tireless energy and so well equipped with experience and ingenuity, that nothing ever daunted him. No cliff was too dangerous and no tree too difficult for him to tackle. His knowledge of Arizona birds was so thorough, that he seemed to know just where each pair of birds would nest. Blessed with the keenest of eyes and ears, he was most skillful in finding nests and a most patient hunter for them. His powers of observation were well trained; he knew the birds and their habitats thoroughly, could recognize all their call notes and was familiar with all their habits. He kept full and accurate notes and records and was thoroughly scientific in his work.

His modest, retiring nature sought no great publicity and his sterling, lovable qualities were known only to his intimate friends. His passing in the prime of middle life means a great loss to American ornithology, but a greater loss to those who really knew him.—A. C. Bent.

George Clement Deane, whose death occurred Jan. 14, 1930, at Cambridge, Mass., was one of four brothers in whose family a liberal interest in natural history is traditional. Born in Cambridge on June 24, 1854, he

lived most of his life in the comfortable old-fashioned home, where in early days the meetings of the newly organized Nuttall Ornithological Club were sometimes held, and where, under the fostering care of his brother Ruthven, the first volumes of the Club's "Bulletin" were assembled and edited. After a boyhood education in the Cambridge public schools, he decided to go West, and in the late '70's, in partnership with Russell Allen of the same city, went into grape raising in San Diego County, California, where they had a vineyard at Bonita in the Sweet Water Valley. Later, in 1881, he engaged in cattle ranching at Hays City, Kansas, but after four years of this, returned to his native city where he spent the rest of his days. The charm of the western life remained with him, however, and in later years he twice visited California, and once extended the journey to Alaska.

In April, 1899, he was elected a member of the Nuttall Ornithological Club, and in the same year became an Associate of the American Ornithologists' Union. His interest in birds, though keen and discriminating, was nevertheless of a somewhat latent sort, for though he frequently reported various items of local interest at the meetings of the Nuttall Club, his estimate of their value was so modest that he never put them into print, and his name does not appear in the three 'Auk' indexes. He was a most loyal member of the Nuttall Club, and frequently opened his hospitable parlor for its meetings, in which he took genuine delight. Of the Children's Museum of Boston he was also a helpful friend; for in the young people of his neighborhood he found constant pleasure. Retiring and almost painfully shy by nature, he yet rejoiced in any opportunity for friendly service and in little acts of thoughtful kindness to his neighbors. A quiet, serene, and kindly spirit, he held high place in the hearts of those who knew him best.—Glover M. Allen.

Edward Arnold, an Associate of the A. O. U. since 1894, died Jan. 2, 1930, at his home in Montreal, Quebec, Canada, in his 66th year. He was born at Kingston, Ontario on August 26, 1864, and at the time of his death had seen nearly fifty years of railway service, filling various positions until finally appointed Auditor of Freight Claims, with jurisdiction over the whole of the Canadian National System. He was also an active Member of the American Railway Association, Claims Section, having been Chairman of the Association, a position at the head of railway claims affairs on this Continent, which was an appreciation of his railway work and value. He was generally considered quiet, unassuming and retiring in his manner, strong in his convictions, loyal to his friends and dependable at all times. He had been interested in birds all his life, and travelling about as he had to do in his various railway capacities gave him the opportunity of studying birds from the Atlantic to the Pacific. He was a fearless climber and his large collection of eggs representing over a thousand species and subspecies was well known among collectors. In addition to this collection, he had a small one of skins and mounted specimens of birds, as well as a much larger one of postage stamps which he had started as a boy, and to

which he had paid especial attention during his later years, when strenuous outdoor work had to be abandoned owing to ill health. He had acquired, also, a small but valuable library, numbering many rare editions, not only in ornithology, but in examples of modern critical and biographical essays and works. In addition to being an Associate Member of the Union, he was a Member of the Cooper Ornithological Club, the Canadian Field-Naturalists' Club, and a late Member of the Province of Quebec Society for the Protection of Birds. He came to reside permanently in Montreal in April 1908, and is survived by his wife Altabella Simons Arnold, and one daughter, Carolyn.—H. Mousley.

Dana Jackson Leffingwell, Assistant Professor of Zoology, and Curator of the Charles R. Conner Museum, in the State College of Washington, and an Associate of the A. O. U. since 1919, died on March 6, after an illness of three days, in St. Ignatius Hospital, Colfax, Wash. At the request of his mother, he was buried at his old home, Aurora-on-Cayuga, N. Y. Dr. Leffingwell was a product of the Laboratory of Ornithology at Cornell University, taking his Ph.D. there in 1925 under Professor Arthur A. Allen. His interests were centered largely around game birds, and more particularly the economic and conservational problems presented by these birds. His paper on the Ring-necked Pheasant, which formed the first of a series of papers he planned under the title "Occasional Papers of the Charles R. Conner Museum" was merely a condensed summary of his voluminous notes on the subject. In his review of it in 'The Auk' (1928, p. 525) no less an authority than W. L. McAtee stated that it contained, ". . . more original observations than any other American paper on the bird. . . ."

Going to Washington State College in the fall of 1926, Leffingwell immediately became the moving spirit in the museum there, and began to devote himself to the study of what was to him him a new fauna. Naturally enough, the Hungarian Partridge, presenting so many problems similar to those he had already studied in connection with the Pheasant in the east, was one of the first species he became actively interested in. Realizing the need for accurate data on individual birds, he applied the methods of bird-banding to his studies, which, with the exception of one short note, unfortunately were never published. However, game birds did not interest him to the exclusion of other forms, and at the time of his death he had compiled a large amount of data on that curious and little-studied bird, Hepburn's Rosy Finch. In this study he was assisted by his wife, who, it is hoped, will be able to finish the manuscript which was well advanced in form.

Bird life appealed to him as well in ways other than the purely scientific, and he was an enthusiastic sportsman, having been secretary of the Tomkins County, N. Y., Chapter of the Izaak Walton League, and later founded at Pullman, the seat of the State College of Washington, a chapter of which he was the first president, and which has since been named in his memory, the Dana Jackson Leffingwell Chapter. He had also been engaged during

the past three summers in surveying the food resources of the streams of New York for the State Conservation Commission.

Leffingwell was born in Brooklyn, New York, on June 13, 1901, and was therefore only 29 years old at the time of his death. His life and work were all before him; his published results represent a small fraction of what he might have accomplished. To his large circle of friends he was always a cheerful, invigorating, and co-operative companion, both in the field and study, and one whose memory will ever be a pleasant one. He is survived by his widow, Anne Maclay Leffingwell, his mother, Mrs. Elizabeth Leffingwell of Aurora, an older brother, Albert, of New York City, and a younger brother, Thomas J., of Aurora. It is understood that his mother is planning to publish a small memorial to him.—HERBERT FRIEDMANN.

Dr. R. L. Webster, head of the Department of Zoology in Washington State College, has kindly furnished the following list of Dr. Leffingwell's zoological publications:

1922. The Glaucous Gull at Ithaca, N. Y. Auk, Vol. XL, No. 3, p. 526. Co-author with Herbert Friedmann.
1925. Connecticut Warbler in Spring Migration in Central New York. Auk, Vol. XLII, No. 1, p. 140.
1925. Mockingbird in Central New York. Auk, Vol. XLII, No. 1, pp. 140–141.
1926. A Preliminary Biological Survey of The Lloyd Cornell Reservation. The Streams, Bull. No. 27, Lloyd Library, Cincinnati, Ohio, pp. 17–18. Co-author with C. K. Sibley.
1926. A Preliminary Biological Survey of the Lloyd Cornell Reservation. The Vertebrates, Bull. No. 27, Lloyd Library, Cincinnati, Ohio, pp. 71–82.
1928. The Ringed-neck Pheasant, Its History and Habits. Occasional Papers No. 1, Charles R. Conner Museum, Pullman, Washington, pp. 1–35.
1928. The Hungarian Partridge in North America, and the Factors Limiting its Distribution. Northwest Science, Vol. II, No. 1, pp. 9–10.
1929. The Grouse Situation in the West. American Game, vol. 18, No. 5, p. 88.

Propagation of Game Pheasants. (In press.)

EDWARD ELTON ARMSTRONG, an Associate of the American Ornithologists' Union since 1904, died at his country home at Cross Lake, Wis., April 29, 1930, at the age of 51. He was the son of George and Rebecca Armstrong and was born at Burlington, N. J., December 16, 1878. His education was received at Burlington and at Washington, D. C. In 1910 he entered the manufacturing business and for a number of years was identified with commercial interests in Chicago.

Mr. Armstrong was interested in the study of birds practically all of his life and during the last 5 years devoted much attention to bird banding at his home at Cross Lake where he banded a considerable number of

birds of various species. His collection of North American birds was extensive including some 8000 birds and 2000 eggs partly obtained by himself and partly from other collectors, and in addition he had a library of ornithological books and publications. He was not only an Associate in the American Ornithologists' Union but also a member of the Chicago Ornithological Society, the Field Museum of Natural History, the Hamilton Club, the Lake Shore Athletic Club, and the Rotary Club, all of Chicago. He is survived by his wife and one daughter.—T. S. P.

WILLEY SOLON MCCREA, an Associate of the American Ornithologists' Union from 1922 to 1927, died at his home in Chicago, on May 27, 1927, at the age of 69. He was born at Morrison, Ill., in 1858, and was a graduate of the Sheffield Scientific School at Yale where he was a member of the class of 1880. In 1872 at the age of 14 he moved to Chicago and after graduation entered business in which he prospered. For many years he was Treasurer of the People's Gas Light and Coal Company before his retirement 10 years prior to his death.

For some time Mr. McCrea was interested in light harness racing, and an account of his principal activities in this field may be found in the 'Horse Review' for June 1, 1927, p. 511. He was also interested in the drama and in outdoor sports. He was a former member of the Crane Lake Club, and President of the Central Illinois Shooting Club on the Illinois River. In his later years he became interested in bird banding and also contributed on several occasions to a fund to aid Jack Miner in furnishing food for Canada Geese at Kingsville, Ontario.

It was said of him that "Few men have ever been regarded with such sincere and spontaneous affection by their friends and associates, and won so universal an esteem from all with whom they came even casually in contact as W. S. McCrea. His temperament was singularly genial. He instinctively sought to place himself in amicable relations with all the world because of his own pleasure in life and his contacts with his fellow-men. . . He was one of those rare souls who seemed unwearied in the doing of acts of kindness, large and small, for all manner of people."

He was married three times and was survived by his wife, Mrs. Vera D. McCrea of Chicago, a daughter, and several grandchildren.—T. S. P.

BARBOZA DU BOCAGE—a Correction. In 'The Auk' for October, 1908, Dr. J. A. Allen published a notice of Barboza du Bocage, of Lisbon, Portugal, whom he stated had 'died recently,' and in 'The Ibis' for the same month Dr. P. L. Sclater also published a notice in which he referred to Bocage's death as having occurred 'in July last.' On the basis of these statements the date of death has been carried in our records for many years as July, 1908. It appears, however, that it actually occurred some months earlier as an extended éloge by Carlos França was delivered on May 2, 1908 (Bull. Soc. Portugaise Sci. Nat., II, pp. 141–194), but the precise date of death was omitted. At the meeting of the Society on Nov. 12, 1907, Bocage's death was announced without date, but in the 'Naturae Novitates' (for

Jan., 1908, p. 130) the exact date was given as Nov. 3, 1907. In the França memorial will be found not only an account of the life of Bocage but also a complete bibliography of his works which will be useful to any students interested in the zoology of Portuguese West Africa.—T. S. P.

JOHN AUSTIN FARLEY, a Member of the American Ornithologists' Union since 1919, and an Associate Member for fifteen years previously, passed away at Fall River, Mass., on March 17, 1930. He was born at Andover, Mass., July 9, 1860, son of Isaac Alvin Farley, who came from Groton, N. H., and of Margaret Elizabeth Cooper of Andover. Following his school days, Farley studied law in a Worcester office; in 1884 he became a reporter on the 'Worcester Telegram,' and in 1888 on the 'Boston Advertiser and Record.'

His inclination turned early toward natural history, particularly ornithology and entomology, so that his spare time was taken up largely with familiarizing himself with both of these subjects. On one occasion he was following up a new bird clue when the trail led him into a piece of woodland on the outskirts of Worcester, where he encountered another man similarly occupied. It turned out to be Edward H. Forbush, curator of the Worcester Museum of Natural History and with this meeting began a life-long friendship. Destined to separate, however, were their paths ere they came together for the great endeavor that closed both careers.

In 1886 Farley accompanied Forbush and Chas. A. Reed on one of their visits to Florida for the purpose of studying and collecting the varied bird life to be found there in those favorable days. He was associated with Forbush from the inception of the Gypsy Moth suppression work in Massachusetts and for several years after 1891 was in charge of this work on Cape Cod with headquarters at Plymouth.

From 1901 through 1903, several years after the death of Dr. Elliott Coues, Mr. Farley undertook the completion of editing the fifth revision of Coues' 'Key to North American Birds.' He served as Assistant Biologist in the Biological Survey at Washington from January 16 to October 31, 1904. His best work, however, was done in ornithological field research in his own state. This culminated in 1916 and the years following when Forbush gathered a corps of observers to collaborate the necessary data for his 'Birds of Massachusetts and other New England States.' Farley became his assistant in this work and served both in the office and the field, verifying old and new records, visiting various observers, collating reliable data and exploring new regions of the state, the western counties in particular, where there were large uninvestigated areas. Following are a few of his nesting records on these and previous trips:

The Seaside Sparrow,[1] July 17, 1896 at Westport (see 'Auk,' 1897, Vol. 14, p. 322);

The Myrtle Warbler, May 17, 1919 in Webster, southern Worcester County (see 'Auk,' 1919, Vol. 36, pp. 581–582);

[1] First breeding record for Massachusetts (see 'Wilson Bull.', vol. 34, pp. 210–211, Dec., 1922).

The Goshawk, May 22, 1922; April 28, 1923; April 18, 1924; in Harvard Forest, Petersham;

The Sapsucker in June 1922, in Franklin and Hampshire counties;

The Olive-backed Thrush in June 1922 from Mt. Greylock as far east as Ashburnham.

Mr. Farley's early newspaper work stood him in good stead in assisting Mr. Forbush. Night after night he returned to his desk in the State House from a full day's work, sometimes to continue all night on the important task of proof reading and correction. . In the end it told on his none-too-strong eyesight; his health became affected and he was compelled to relinquish the work in the summer of 1927. He never recovered his health and gradually failed.

Mr. Farley had a delightful personality, full of whimsical wit and many a classic quotation. In the field he was exceptionally keen of ear and could identify most resident and many of the migratory birds, the Warblers in particular, at considerable distance, by their songs or call notes. He visited Europe several times and Egypt once. For nine years he had been a resident member of the Nuttall Ornithological Club in Cambridge. He never married. His remains were taken to the family lot at Andover for burial.—Aaron C. Bagg.

The Final Resting Place of Charles Lucien Bonaparte.—At the last annual meeting of the American Ornithologists' Union in Philadelphia, the writer was requested by Dr. T. S. Palmer to locate the resting place of Bonaparte, the 'Father of American Systematic Ornithology.' In reply to an inquiry, Mr. J. A. G. Rehn, Secretary of the Philadelphia Academy of Natural Sciences, suggested that Dr. H. A. Menegaux of the Paris Museum might throw some light on the subject. Acting on this suggestion a letter was addressed to Dr. Menegaux which brought a reply that he had no information at hand but would write later. On April 25, 1930, a letter arrived enclosing two others, one of which was an official note in French addressed to Dr. Menegaux by the Mayor of Ajaccio, Corsica, dated February 7, 1930. Following is a translation of this note: "In response to your letter of last February, I have the honor to inform you that the body of Charles Lucien Jules Laurent Bonaparte, Prince of Canino and of Musignano, born at Paris the 24th of May, 1803, died at Paris the 29th of July, 1857, son of Lucien Bonaparte, brother of Napoleon the First, is buried in the Bonaparte Chapel at Ajaccio."

Full credit should be given to Mr. Rehn and Dr. Menegaux for furnishing this bit of information, particularly interesting to ornithologists on account of the conspicuous part which Bonaparte played in the early stages of systematic ornithology in America. Until the present time all trace of Bonaparte's final resting place had been lost by American ornithologists.—William Howard Ball.

NOTES AND NEWS.

THE FATE of the Eagle Bill is still undecided as we go to press. Opposition to the adequate protection of the Eagle in Congress has seriously jeopardized it and only continued agitation of the subject, even if it fails of passage at this time, will eventually save this noble bird.

Everyone must keep up the campaign of education in behalf of Eagles and most Hawks and Owls, and the National and State Departments in charge of conservation matters, and the Audubon Societies, should exert every effort to protect these birds. The evidence of their work has been secured and should be spread broadcast.

THE NEW A. O. U. Check-List is now entirely in type and the proofs are being examined by some twenty leading ornithologists in addition to the Committee, in an effort to make the ranges as accurate as possible. The Chairman with the assistance of members of the Committee is also checking up all the references and making them more explicit, while the type localities are being revised and quoted verbatim from the original sources.

IN AMERICA we have been fortunate in having the opportunity to build up many things without being hampered by old rights and customs. In the field of ornithology, this has enabled us to achieve a code of bird protective laws and regulations free for the most part from incongruous minor defects. Acquaintance solely with our conditions hardly prepares us to realize that in the older countries a constant struggle for the improvement of bird protection is necessary and conservationists are only achieving bit by bit things that have been accomplished in this country by far more comprehensive measures. To illustrate the situation, we may cite that in Belgium there has only just been secured through the action of a minister of agriculture favorable to birds, regulation of bird exhibitions which had been made the excuse for capture of large numbers of wild birds, even of the protected species. It has been decreed that in the future no birds enjoying absolute protection will be permitted in these exhibitions. The use of blinded finches for song competitions had flourished until comparatively recent times in France and Belgium, but friends of the birds were able to secure action from the respective ministers of agriculture entirely prohibiting this practice. Trapping of certain birds is permitted but the use of ground snares has been abolished and this will be a considerable protection to thrushes and to game birds. The season for trapping Ortolans was shortened because it had been made a pretext for snaring other species of birds. These ameliorations in regulations pertaining to birds have been obtained largely through the energies and activities of the Marquise de Pierre, President de la Ligue Belge Pour la Protection des Oiseaux, and a leading contributor to the 'Bulletin Trimestriel' of that society.

While this news item stresses abuses of birds that we do not experience in the United States, it must be admitted that in some respects practices in certain European countries are ahead of ours. For instance, pole traps have been abolished in Belgium, Bavaria, Prussia, and England, but in the United States they are permissible everywhere except in New Jersey. The Owls, including even the Eagle Owl, counterpart of our Great-horned, are entirely protected in Belgium, an example that could well be followed in many parts of our country.

A NEW series of twelve colored reproductions from the Wallace Havelock Robb collection of bird paintings by Allan Brooks is being reproduced and will be on sale at the Royal Ontario Museum of Zoology in the near future. The demand for the first series was gratifying to the staff of the Museum and to Mr. Robb. It is apparent that these illustrations are filling a want created by the increasing interest in nature-lore, particularly bird-lore. The new series is to be uniform in size and method of reproduction with the first. They have been made from the collection of paintings by the Canadian bird artist held in the Royal Ontario Museum of Zoology for the people of Canada. The bringing together of this collection is one of the public spirited accomplishments of Mr. Robb. His work, including the fostering of "Abbey Dawn," a sanctuary for wild life near Kingston, Ontario, is promoted under the patronage of His Royal Highness, The Prince of Wales. Mr. Robb intends to enlarge the collection of paintings, now comprising fifty-five, to one hundred, as soon as it is possible.

NOTICE.

MEMBERS who expect to present papers at the next annual meeting of the Union in Salem, Mass., October 20–23, are requested to send to the Secretary, before October 1, the titles of their contributions with a statement of the time necessary for the presentation of their papers including lantern slides or moving pictures.

An estimate of time required will not suffice as experience shows that it usually takes twice as long to read a paper as the writer expects, not to mention the introductory remarks that may be added. Careful timing of the paper exactly as it is to be presented is absolutely necessary or speakers who are to follow will be crowded off the program.

An outline or abstract of the paper of 150 to 200 words should be sent with the title so that it may be properly placed on the program. This is very important.

The Secretary desires to arrange the program to the best possible advantage, and to allow time for discussion and must have the co-operation of the speakers. Papers submitted at the last moment cannot be given consideration.

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